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THE
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The Principles of Arithmetic and Practical Geometry;
with the Extraction of the Square and Cube Roots:
Also Rules for finding the Prime, Epact, Moon's
Age, Time of High-Water, with Tables for the same.

TOGETHER WITH

Exact Tables of the Sun's Place, Declination, and Right-Ascension: Of the Right Ascension and Declination of the
Principal Fixed Stars: Of the Latitude and Longitude of
Places: A large Table of Difference of Latitude and Departure, for the exact Working a Traverse.

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The Description and Use of the Sea-Quadrant, Fore-Staff
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BY
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The whole revis'd, and adjusted to the NEW STILE,
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To the Ingenious MARINER.

I Here prefent thee with a New Calendar, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practifed) but to make Things plain and practicable : Here is nothing obfcure or difficult to difcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainnefs (both as to Matter and Method) as poffible ; and I affure thee was I prefent to inftruct thee, I could by no means render things more intelligible than I have here done : I have endeavoured to omit nothing that might be materially ufeful, having refpect to the defign'd bignefs of the Volume. The Contents are as follow:

The Principles of Arithmetic, with which I begin, becaufe I am fenfible of the Lofs fome have been at, that have attempted Navigation before they have underftood fomething of it ; the Extraction of the Square and Cube Roots ; In all which I have endeavoured to apply the Examples to Sea Affairs. Some neceffary Geometric Problems, ufeful in Navigation ; Directions for finding the Prime, Epact, Moon's Age, and the Time of Full Sea (both according to the ordinary and a more accurate Way) with Tables for the fame.

Tables of the Sun's Place and Declination, with Directions and Examples to every Cafe, how to ufe the Declination to find the Latitude : As alfo the neceffary Tables for correcting the Declination, when the Difference of Longitude is confiderable from the Meridian of London, for which the faid Tables of Declination are calculated : A Table of the Sun's Right Afcenfion : A Table of the Right Afcenfion and Declination of fome of the principal fixed Stars, with the ufe of the faid Tables in finding the time of a Stars coming to the Meridian ; as alfo Directions at large for Obfervation of any of the faid Stars to find the Latitude of the Place, with Examples in each Cafe. The Defcription of the Sea-Quadrant, Fore-ftaff and Nocturnal : A Table of Latitude and Longitude of the principal Places on the Sea-Coaft, collected from the beft Information. Problems in Plane Sailing and Aftronomy, (which that the Practitioners might learn two things at once) are wrought both by the Logarithms, and Gunter's Scale : A large and very ufeful Table of Difference of Latitude and Departure to every Degree and Quarter Point of the Compafs ; With its ufe in working a Traverfe in order to keep a Reckoning at Sea : A Rutter for the Coaft of Great-Britain, France, Ireland, Spain, Portugal, &c. Shewing the Bearing and Diftance from one Place to another : A Table of the Soundings coming into the Channel, giving the Depth of Water, and Quality of the Ground ; Laftly, Directions for failing into fome principal Harbours ; By all, or any of which, if thou art by any means profited (as I know thou mayeft, if thou wanteft Information in any of thefe Things, and doft but carefully animadvert upon what thou readeft) I have my End ; And thy kind Acceptance hereof will further oblige

Thy fincere Friend,

Nathaniel Colfon.

The Principles of Arithmetic briefly and plainly demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetic*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made ; and firſt of

Numeration.

NUmeration is that part of *Arithmetic*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	Two,	Three,	Four,	Five,	Six,	Seven,	Eight,	Nine,	Cypher,

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right-Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are ſet in, as 1 in the firſt Place, or Places of *Units*, is *One* ; in the ſecond Place *Ten* ; in the third Place *One Hundred* ; in the fourth Place *One Thouſand* ; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number* ; As 123, which *Number* conſiſting of three Places, is thus numbred, *One Hundred Twenty Three* ; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred Twenty Three Thouſand, Four Hundred fifty-ſix* ; and this *Number* 123456789, conſiſting of nine Places, is thus numbred, *One Hundred twenty-three Millions, Four Hundred Fifty-ſix Thouſannds, Seven Hundred Eighty-Nine.*

ADDITION.

ADdition is that which makes but one Sum of feveral *Example.* Suppofe four Men (A. B. C. D.) owe me feveral Sums of Money, I would know how much is due to me in the whole: I begin at the firft Row towards the Right-Hand and fay, 3 and 6 is 9 and 2 is 11, and 4 is 15; fetting down the 5 under the Row added up; then I carry the 1 ten to the next Row, faying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; fet down 9 under the Row, added up, and carry 1 to the next row, faying 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; fet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which becaufe this is the firft row, I fet down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thoufand, Nine Hundred, Ninety-five Pounds.*

A

A oweth	3564
B ———	5432
C ———	3156
D ———	1843
	13995

Exam. 2. Suppofe I have feveral Creditors to whom I owe feveral Sums of Money, I defire to know the whole.

Beginning again (as before in *Addition*) at the Right-hand, I fay 11 and 10 is 21, and 4 is 25, and 6 is 31; now confidering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* whereof I fet down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, faying 2 and 4 is 6, and 8 is 14 and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* fet down 14*s.* and carry the 1*l.* to the next row, faying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; fet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; fet down 2 and carry 1: Laftly, 1 and 1 is 2; fo that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

Charaĉters ufed in Arithmetic.

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

A

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppofe at Sea, keeping my Reckoning in Degrees and Minutes, having fix Days Difference of Longitude, I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, fet down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; faying 1 that I carried and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7, fo that the whole Difference of Longitude made thefe 6 Days, is 7 Degrees and 26 Minutes.

		°	′
1	Day	1	06
2	———	0	56
3	———	1	09
4	———	2	00
5	———	1	02
6	———	1	13
0	———	7	26

Subtraĉt-

SUbtraction is the taking of a lefs Sum out of a greater, and finding the Remainder.

Example. Suppofe a Man oweth me ——— ——— ——— 376 : 13 : 06
And hath paid me ——— ——— ——— 211 : 05 : 08
I defire to know what remains unpaid, which is ——— ——— 165 : 07 : 10

| | l. | s. | d. |

To work this I fay, 8 from 6 I cannot, but confidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and fay 8 from 18, and there remains 10, which fet down under the Pence ; and then having borrowed 1, I go to the next Row, and fay, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7 ; then proceeding to the Pounds, I fay, 1 from 6 there remains 5, and 1 from 7 there remains 6 ; and laftly, 2 from 3, there remains 1 : fo there remains due of the faid Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppofe the Diftance between two Places to be 1000 Miles, and that I have failed 396, and defire to know how many Miles I have to Sail.

Placing 396, under the 1000, I fay, 6 from 0 I cannot, but 6 from 10 there remains 4 ; proceeding to the next Figure I fay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0 : Again, 1 that I borrowed and 3 is 4, from 0 I cannot ; but 4 from 10, there remains 6 : Laftly, 1 that I bor-rowed from 1, there remains 0 : So there remains 604 Miles.

	Miles
	1000
	396
	604

Example 3. Suppofe one Place in the Latitude of 51 Deg. 32 Min. N. and another in the Latitude of 42 Deg. 10 Min. N. I would know the Difference of Latitude between them.

To do which, fubtract the lefs Latitude out of the greater thus ; the leffer being placed undermoft, fay, 10 from 32, there remains 22, which place under the Minutes ; then for the Degrees, 2 from 1 I cannot, but 2 from 11, there remains 9 ; then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

d.	m.
51 :	32
42 :	10
9 :	22

So the Difference of Latitude is 9 Deg. 22 Min.

MULTIPLICATION.

MUltiplication is that which ferves inftead of many Additions, by which any Number of a greater Denomination is brought into a lefs, as Pounds into Shillings, Shillings into Pence, and Pence into Farthings ; Degrees into Minutes, Minutes into Seconds, and the like ; which is done by multiply-ing the Number of the greater Denomination, by that number of the leffer which is contained in one of the greater ; as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and fo of the reft.

Multiplication confifts of Three Parts.
1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceffary to infert the following Table which is firft to be committed to Memory.   The

The Multiplication T A B L E.

2 times $\begin{Bmatrix}2\\3\\4\\5\\6\\7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}4\\6\\8\\10\\12\\14\\16\\18\end{Bmatrix}$

3 times $\begin{Bmatrix}3\\4\\5\\6\\7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}9\\12\\15\\18\\21\\24\\27\end{Bmatrix}$

4 times $\begin{Bmatrix}4\\5\\6\\7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}16\\20\\24\\28\\32\\36\end{Bmatrix}$

5 times $\begin{Bmatrix}5\\6\\7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}25\\30\\35\\40\\45\end{Bmatrix}$

6 times $\begin{Bmatrix}6\\7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}36\\42\\48\\54\end{Bmatrix}$

7 times $\begin{Bmatrix}7\\8\\9\end{Bmatrix}$ is $\begin{Bmatrix}49\\56\\63\end{Bmatrix}$

8 times $\begin{Bmatrix}8\\9\end{Bmatrix}$ is $\begin{Bmatrix}64\\72\end{Bmatrix}$

9 times 9 is 81

10 times 10 is 100

Example 1.   I demand how many Shillings there are in 5648*l.*
To Anſwer this, multiply the given Number of Pounds by 20,
Thus ; The firſt being o Cypher, ſet down o underneath the firſt
Figure ; and then proceed to the next Figure, and ſay 2 times 8
is 16 ; ſet down 6 under the ſecond Figure and carry 1 ; then
2 times 4 is 8, and 1 that I carried makes 9 ; then 2 times 6 is
12, ſet down 2, and carry 1 ; laſtly, 2 times 5 is 10 , and 1 that I carried
makes 11.   So that 5648*l.* multiplied by 20, makes 112960 Shillings.

l.
5648
20
———
112960

Ex. 2. In 276 Degrees how many Minutes ?
Firſt ſet down ———————————————— 276
Then (becauſe 60 Minutes make a Degree) multiply by ——— 60
The Product is ——————————————————— 16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Ex. 3. Multiply ——— 8765437
By ——————— 32
————
17530874
26296311
————
Product ——— 280493984

Multiply ——— 47632867
By ——————— 4352
————
95265734
238164335
142898601
190531468
————
207298237184

D I V I S I O N.

Diviſion is that which ſerves inſtead of many *Subtractions,* and is
uſeful in reducing all Numbers of a leſſer Denomination into a greater
as Minutes into Degrees, Farthings into Pence, Pence into Shillings,
Shillings into Pounds.   It conſiſts of Three Parts, (*viz.*) *Dividend*

Number to be divided ; the Divifor, or the Number to divide by ; and the Quotient ; alfo if any Number remain, it is called the Remainder.

Example 1. To divide 7834 by 23 ; firft fay, how many times 2 in 7 ; Or how often 23 in 78, the Anfwer will be 3 times, which place in the Quotient ; then multiply the Divifor 23 by 3, the Figure placed in the Quotient, faying 3 times 3 is 9, and 3 times 2 is 6, place thefe under the two firft Figures of the Dividend, and draw a Line ; fubtracting 69 from 78, there refts 9, which fet underneath, and place a Point under 3, to fhew that it is brought down ; place it to the 9, then proceed, faying, how many times 23 in 93, or how many times 2 in 9, which will be 4 times ; place 4 in the Quotient, by which multiply the Divifor : Again, placing the Product which is 92 under 93, draw a Line and fubtract it therefrom, the Remainder 1 put under the Line, and fet down 4 the laft Figure in the Dividend, putting a Point under it, and place it to the Remainder 1 ; then becaufe there remains but 14, being lefs than the Divifor 23, and fo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finifhed.

	Divif.	Divid.	Quot.
	23)	7834	(340
		69 ··	
		93	
		92	
		14 Rem.	

Example 2. In 360 Minutes how many Degrees ? Here I divide by 60, becaufe 60 Minutes make a Degree, and becaufe the laft Figure of the Divifor is a Cypher, I cut it off, and with it the laft Figure of the Dividend, which is here alfo a Cypher, and divide 36 by 6, (which is the fame Thing as to divide 360 by 60) but becaufe 6 cannot be taken out of 3, therefore I fay, how many times 6 is 36 ? The anfwer is 6 times : Which I place in the Quotient, and proceed to multiply the Divifor 6, by the 6 placed in the Quotient, which produceth 36, which fubtracted leaves 0 ; fo that by this Work it appears, that in 360 Minutes there are 6 Degrees juft.

	Divif.	Divid.	Quot.
	6|0	36|0	(6
		36	
		00	

Example. 3. A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's Share, being equally divided ?

Divifor.	Dividend.	Quotient.	
253)	59875	(236	253
	506 ··		236
	927		1518
	759		759
	1685		506
	1518		167
	167 Remains		Proof 59875

Firft, fay, how many times 2 in 5 ? The anfwer is two times, which place in the Quotient ; then multiply the Divifor 253 by 2, the Figure placed in the Quotient, faying 2 times 3 is 6, 2 times 5 10, fet down 0, and carry 1 ; 2 times 2 is 4, and 1 is 5. which fet down under the 3 firft

B

Figures

Figures of the *Dividend*, from whence being fubtracted, fet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and fet it after 92, the Remainder; then fay, how often 2 in 9? Anfwer 3 times (for 4 will prove too many.) Then multiply the *Divifor* 253, as before, by 3, the Figure laft placed in the Quotient, and the Product will be 759, which being fubtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, fetting it after 168, the laft Remainder: And again, afk the Queftion how often 2 is contained in 16? Anfwer 6 times; by which 6, which fet in the Quotient, multiply the *Divifor* 253; and the Product is 1518, which place under the laft *Dividend*, and fubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finifhed, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may eafily be done by multiplying 167 by 240, and dividing the Product by 253, give each Man's Share in Pence. The Proof is by multiplying 253 the *Divifor* by 236 the *Quotient*; then taking in 167 the Remainder, under the 3 laft Figures, the Product will make the fame with the *Dividend*, as you fee in the Operation.

The Rule *of* THREE,

IS that which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firft, and the Quotient of the faid Divifon is the Anfwer to the Queftion.

Example 1. If in 24 Hours a Ship fails 130 Miles; how many Miles will fhe fail with the fame Gale in 192 Hours or eight Hours;

Hours	Miles	Hours
24 ————————	130 ————————	192
		130
		————
24)24960(1040 Miles in 192 Hours		5760
24 ···		192
————		————
96		24960
96		
————		
00		

Here 24 is the firft Number, 130 the fecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the fecond and third Numbers together, and divide the Product thereof 24960, by 24 the firft Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours, the Time propofed.

Example 2. If 1 lb. of Tobacco coft 6*d.* what will 112 lb. coft?

$$112$$
$$6$$
————————
12)672 Pence (or 56 Shillings.

Here the firft Number being an Unit, which neither multiplies nor divides, it faves the Labour of Divifion; and the Anfwer is 672 *d.* for the
Anfwer

Anfwer will be of the fame Name with the fecond Number which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 lb. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards: How high is that Caftle whofe Shadow is 100 Feet?

Which Queftion for the more ready Solution, ftate thus:

If 6 Feet (which is two Yards) give 9 Feet, what will 100 Feet give?

By the Operation it appears the faid Caftle muft be 150 Feet high.

```
        9
6)900(150 Feet
   6
   ──
   30
   30
   ──
   00
```

Example 4. If 564 *l.* 12 *s.* 6 *d.* is to be divided between 165 Men, how much is one Man's Share.

Firft, Reduce it all into Pence, by multiply 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292, multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564 *l.* 12 *s.* 6 *d.* Then fay,

If 165 Men have 135510 Pence, how many fhall one Man have? And here you fhould multiply 135510 by the laft Number, but in this Cafe it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 Remaining are 5 Pence to each Man's Share.

Note, The 45 Remaining of the firft Divifion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing.

The Operation follows.

```
564 l. 12 s. 6 d.
   20
 ─────
 11292
   12
 ─────
 22590
 11292
 ─────
165)135510(821 Pence
    1520··
    ────
     351
     330
     ───
     210
     165
     ───
      45
```

```
12)821(68 Shillings, equal
   72·      to 3 l. 8 s. 5 d.
   ──
   101
    96
   ──
    5
```

Note, That in the *Rule of Three,* the firſt and third Numbers muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein ; as in the foregoing Example, I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers, I put the Denomination of Men firſt and laſt, and the Money in the Midſt, to anſwer to that Part of the Rule, which requires the firſt and third Numbers to be both of one Name. The Anſwer whereof in the preceeding Queſtion, as by the Operation appears, is 821 Pence ; which reduced into Shillings, is 68 *s.* and 5 *d.* or 3 *l.* 8 *s.* 5 *d.* one Man's Share, as was required.

The next thing I ſhall briefly treat of is, *The Extraction of the* Square and Cube Roots, as alſo ſomewhat of their Uſe.

The Extraction of the Square Root.

```
  . .
7056(84 Root.
64
————————————
164)656 Divifor.
    656
————————————
    000
```

Ex. 1. TO Extract the Square Root of 7056 proceed thus : Firſt, Point the given Numbers (that is, put a Prick over every other Figure, beginning at the firſt Figure at the Right-hand) and note by the Way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Number ; then proceed, ſeeking the greateſt Square Number (which is a Number multiplied by itſelf) in the firſt Point towards the Left-hand (70) which is 64 conſtituted of 8 multiplied into itſelf; for 8 times 8 is 64. The Root of the Square Number which is 8, place in the Quotient, and ſubſcribe the Square Number (64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath : To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place *(viz.* **16.**) therein calling it the Diviſor, ſeek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right-hand : *(viz.)* How many times 16 in 65 ? The anſwer is 4 times, which place in the Quotient, and alſo on the Right-hand of the Diviſor (16) then multiply the Diviſor (164) by the 4 laſt placed in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom ; which done, nothing remains : So that the Square Root of 7056 is 84.

The Square Root is applied to Navigation as follows :

Any two Sides of a Right-angled Plane Triangle being given, the third is found by the Extraction of the Square Root

Example 2. Suppoſe a Ship hath made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required, the ſaid Diſtance is found by the Extraction of the Square Root, as follows :

The Rule. Square the Difference of Latitude and Departure ſeverally (that is, multiply each by itſelf) and from the Sum of both the Squares added together, extract the Square Root, which will be the Diſtance required.

Example.

Difference of Lat. 87	The Departure 71	Square Diff. Lat. 7569
Multiplied by itfelf 87	Multip. by itfelf 71	Square Departure 5041
609	71	their Sum 12610
696	497	
The Square = 7569	The Square = 5041	

12610(112 the Diftance req.

1

21)26

21

222) 510

444

66

By the Operation it ap-pears, that the Diftance, omitting the Fraction, is 112 Miles.

Example 2. Suppofe a Ship's Diftance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required ; the faid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diftance fubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Diftance ——— 111   The Departure = 57

Multiplied by itfelf ——— 111   Multiplied by itfelf = 57

111

111

111

399

285

Sq. of Departure = 3249

Square of the Diftance ——— 12321

Square of Dep. fubtract ——— 3249   9072(95 Diff. Lat. required

Remains — 9072   81

185)972

925

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

47

If the Departure be required, the Rule is, from the Square of the Di-ftance, fubtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Bre-vity-fake is omitted.

Having proceeded thus far in fhewing the *Practitioner* how to find the Di-ftance, Difference of Latitude and Departure (any two of them being given, without Trigonometry) I fhall fhew the Manner of finding the Courfe exact enough for common Ufe, without the faid Operation, which is done as follows.

The Proportion to find the Courfe; As the Sum of the Hypotenufe (or Diftance) and half the greater of the other two Legs *(viz.)* if the Difference

of

of Latitude be moſt, half that, but if the Departure be moſt, half that; ſay; As the Sum of theſe two, is in Proportion to the leſſer (or remaining) Leg; ſo is 86, to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Complement of the Courſe.

Example. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, Add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is ———————————————— 110
Half the greater Leg (88) is ———————— 44
The Sum ——————————————————— 154

Having thus done, ſay, by the Rule of THREE.

As the ſaid Sum 154, is to 66 the leſſer Leg; ſo is 86, to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60, (the Number of Min. contained in a Degree) and divide the Product by the Diviſor (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minutes : So that the Courſe required is 36 deg. 51 min.

```
            66
          ————
          516
          516
        ————————
  154)5676(36 deg.   51 min.
      462            132
    ————             60
    1056           ————————
     924         154)7920(51
    ————             770
     132           ————
                    220
```

Example 3. Extraction of the Square Root. Suppoſe a Rope 5 Inches Compaſs, and another Rope of double the Strength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root :* For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compaſs of the given Rope, (*viz.* 5.) and multiply that by itſelf; which Product (becauſe the other Rope is to be twice as ſtrong, multiply by 2, and the Square Root of the Product is the Compaſs of the Rope required.

Example. The given Ropes Compaſs 5 Inches, Extract the Root

```
                                       Inch.
                                     50(7
Multiplied by itſelf ———————— 5
                      ————            49
The Square — —————— — 25             ———
Multiplied by——— ——————— 2             1
                      ————
                       50
```

So by this Operation it appears that a Rope muſt be 7 Inches and a little better, to be twice the Strength of the given Rope of 5 Inches Compaſs.

If it's deſired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the Weight of the one to the Weight of the other, Length for Length. *Ex.* Suppoſe a Cable of 10 Inch. to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say,

as

as 100 (the Square of 10) is to 64 the Square of 8: So is 25 C. the Weight of one Cable to 16 C. the Weight of the other required.

Extraction of the Cube Root.

I Shall firft, as neceffary, infert a Table of the Cubes of the Nine Digits, which out to be committed to Memory.

Cube of the Nine Digits.
$$\begin{cases} 1 \text{ ——— } 001 \\ 2 \text{ ——— } 008 \\ 3 \text{ ——— } 027 \end{cases} \begin{cases} 4 \text{ ——— } 064 \\ 5 \text{ ——— } 125 \\ 6 \text{ ——— } 216 \end{cases} \begin{cases} 7 \text{ ——— } 343 \\ 8 \text{ ——— } 512 \\ 9 \text{ ——— } 729 \end{cases}$$

Example 1. Extract the Cube Root of 12167.

Firft, Point the given Number, *(i.e.)* put a Prick over every third Figure (beginning at the Right-hand) then feek the greateft Cube in the firft Point, *(viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; fubtract the Cube (8) from the firft Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Refolvend, then draw a Line underneath it, then fquare the Quotient 2, which is 4; multiply the faid Square (4) by 300, which makes 1200; place this under the Refolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and

```
12167 (23 Root
 8
————————
 4167 Refolvend
 1200 Triple Square
   60 Triple Quot.
————————
 1260 Divifor
 3600
  540
   27
————————
 4167
  000
```

call it the Triple Quotient; add thefe two *(viz.)* Triple Square and Triple Quotient into one Sum, and call it the Divifor; feek how often this Divifor is contained in the Refolvend, which is three times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 laft placed in the Quotient, and fubfcribe the Product underneath the Divifor; fquare the faid Figure (3) laft placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laft Product; Cube the Figure (3) laft placed in the Quotient, and place it under the preceding Product. Laftly, add thefe three Products into one Sum, fubtracting the faid Sum from the Refolvend, fubfcribe the Remainder; to which Remainder, had there been any more Figures, the next Point muft have been brought down, and the preceding Work repeated from the fquaring of the Quotient, until all the Figures are fo brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

Example 2. *Applied,* Suppofe a Ship of 300 Tnn, 75 Feet by the Keel, 29 Feet and an half by the Beam, and 14 Feet Depth in the Hold; another Ship is defired of the fame Mould and Shape of 500 Tuns; the fevcral Dimenfions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. Firft, Cube the Length of the given Keel, which is done by multiplying it into itfelf, and then multiplying the Product by it again.

Then

Then say by the Rule of Three: As 300 Tuns the one Ship's Burthen, to 500 Tuns the other Ship's Burthen; so is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length; Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction three Cyphers are added to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ Parts.

Thus, having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three.

Thus, suppose the next Thing I would find be her Breadth by the Beam, say, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*; so 29½ Feet the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Feet. In the same manner you may find the Depth in the Hold, &c.

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9 lb. and the Diameter of a Shot of any other Weight, suppose of 72lb. required. This is also done by the Extraction of the Cube Root, as follows:

First, say, by the Rule of Three.

As 9lb. the Weight of one Shot, to 72lb. the Weight of the other; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter, which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

But if it was required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

As the Cube of one Shot's Diameter to the Cube of the other; so is the Weight of the one Shot, to the Weight of the other required?

And thus much for the *Arithmetic Part* of this Treatise.

75	given Keel
75	
375	
525	
5625	
75	
28125	
39375	
421875	Cube given Keel

703125($88\frac{9}{10}$ Root
512

191125	Resolvend
19200	Triple Square
240	Triple Quotient
19440	Divisor
153600	
15360	
512	
169472	
21653000	Resolvend
2323200	Triple sq.
2640	Trip. Quot.
2325840	Divisor
2090880	
213840	
729	
21123369	
529631	Remainder.

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*

LET the Line given be A B, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances C A and CB. Then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch D E; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, thro' the Interſection, (or cutting) of the two Arches FG and DE, which was required.
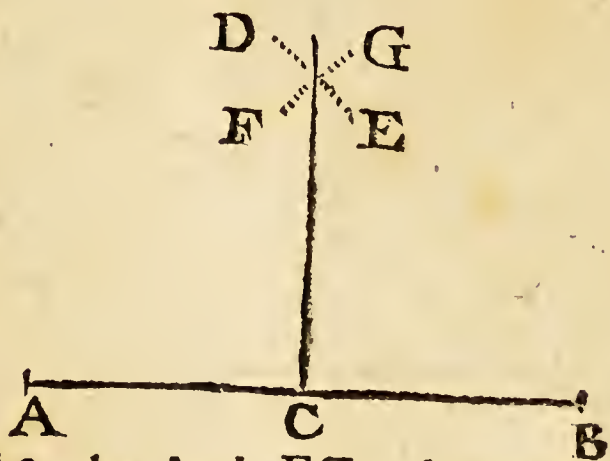
Prob. II. *To raiſe a Perpendicular on the End of a Line.*

Let the Line given be AB, the Perpendicular to be raiſed from the Point B; to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E, then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch F G; and placing the Compaſſes in the Point E, deſcribe the Arch H I; then from the Point B, and through the Interſection of the two Arches F G and H I, draw the Perpendicular which was required.
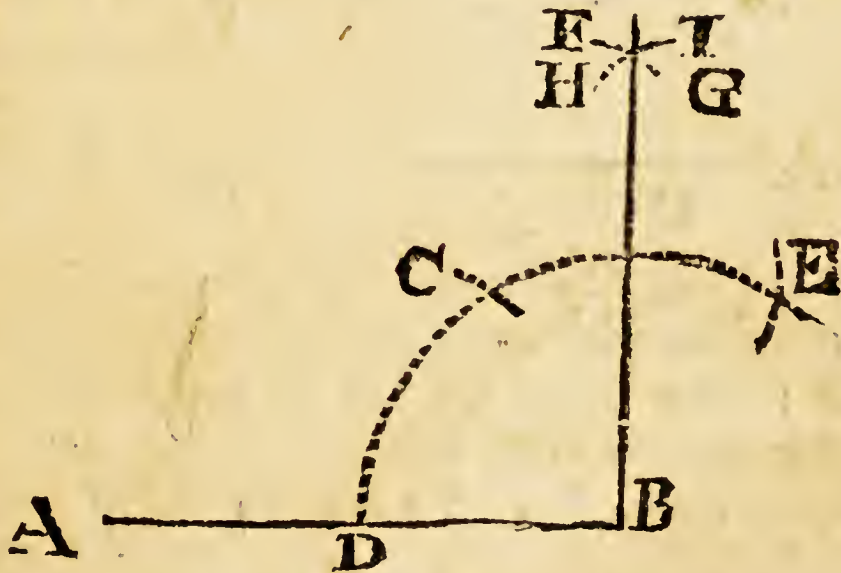
Prob. III. *To let fall a Perpendicular from a Point aſſigned, over a given Right Line.*

Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch G H; then from the Point C, and through the Interſection of the ſaid two Arches, draw the Perpendicular CD, which was required.   C
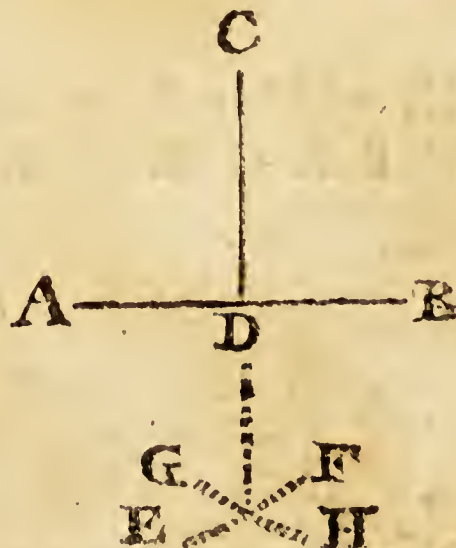
Prob.

Prob. IV. *Another way to let fall a Perpendicular from a given Point, on a given Right Line.*
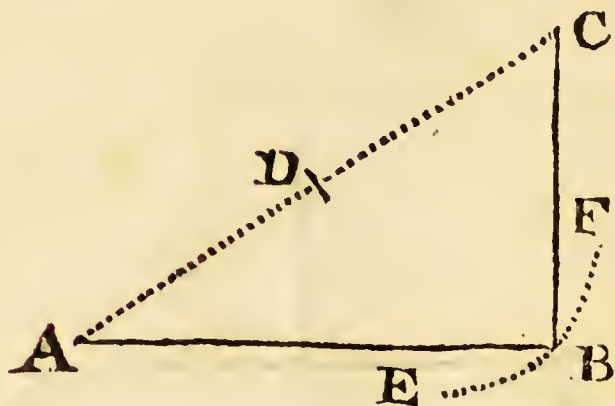
Let the Line given be AB, upon which it is required to let fall a Perpendicular from the Point C; to do which, from the Point affigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compaſſes reſting in the Point D, with the ſame diſtance, (*viz.* of half the Line AC) defcribe the Arch EF: Then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

Prob. V. *To draw a Line parallel to a Line given.*
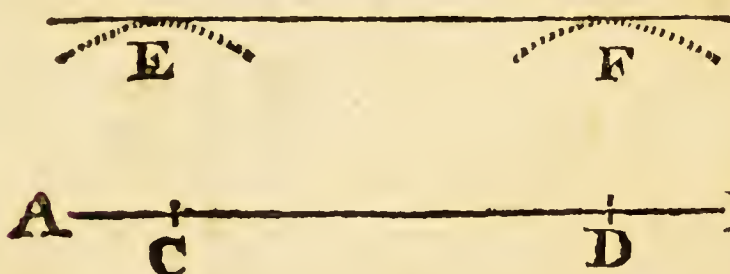
Let AB be a Line given, to which it is required to draw a Line parallel, to do which, firſt take in the Compaſſes the diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line A B, defcribe the Arch E; and with the ſame diſtance, with one Foot of the Compaſſes in the Point D, defcribe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

Prob. VI. *To draw a Right Line Parallel to a given one, that ſhall paſs through a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line Parallel thereto, that ſhall paſs thro' a given Point, as **C.**
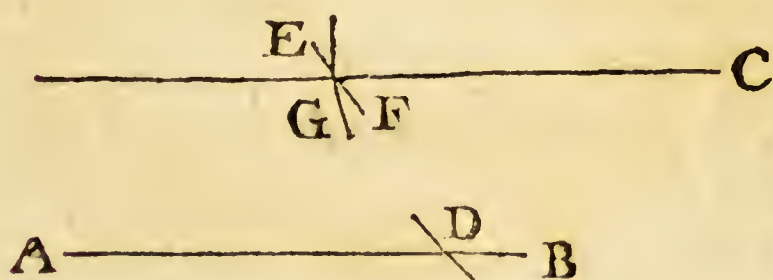
Set one Foot of the Compaſſes in C, with the other at any diſtance, croſs AB in D, and with that diſtance from any Point as A, in the Line AB defcribe the Arch EF; then from C with the diſtance A D croſs the Arch EF in G, and draw the Line CG, which will be parallel to the given Line AB, as was required.

P R O B. VII. *To make an Angle equal to any Angle given.*
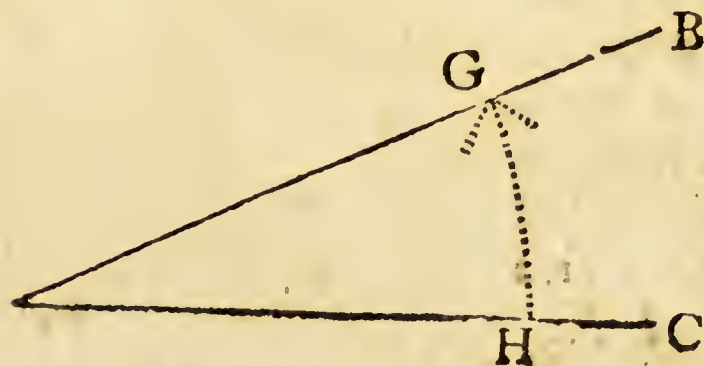
Suppoſe B A C an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line D E, then with any convenient Diſtance leſs than A C, defcribe the Arch GH, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the Arch

Arch GH fweep the Arch KL; take
theArch GH in the Compaffes, and
fetting one Foot in the Point L,
crofs the Arch LK in the Point K,
then through the Point K draw the
Line DKF, then is the Angle EDF
equal to the Angle BAC, as was
equired.
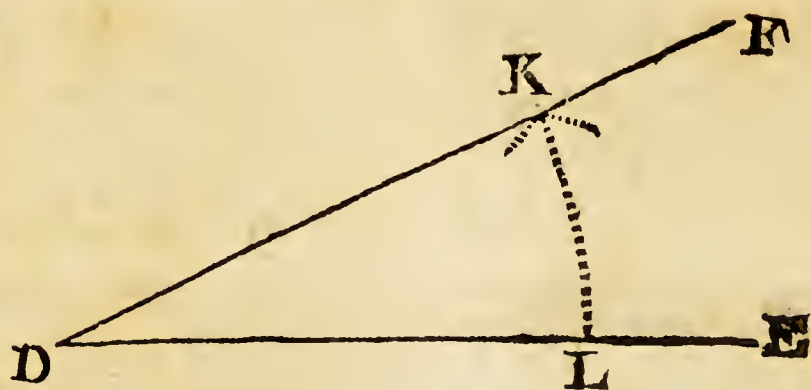
Prob. VIII. *To bring any three Points not fituate in a Right Line, into the Circumference of a Circle.*

Let the three Points thro' which the
Circle is to pafs be A,B,C: Take above
half the Diftance between the two Points
A and B in the Compaffes; and one Foot
of the Compaffes being in the Point A,
with the faid Diftance defcribe the Arch
ED; and with the fame Diftance, one
Foot of the Compaffes being in the Point
B, mark the Arch ED in the Points E
and D, and draw the Right Line ED;
then take above half the diftance between the Points C and B in the Com-
paffes, and one Foot of the Compaffes being in the Point C, with the faid
Diftance defcribe the Arch F G; and with the fame diftance, one Foot
of the Compaffes being in the Point B, mark the Arch FG, in the Points
F and G, and draw the Right Line F G : Now where the two Right
Lines DE and FG, being continued, interfect each other (*viz.* in the Point
H) is the Center of the Circle required.
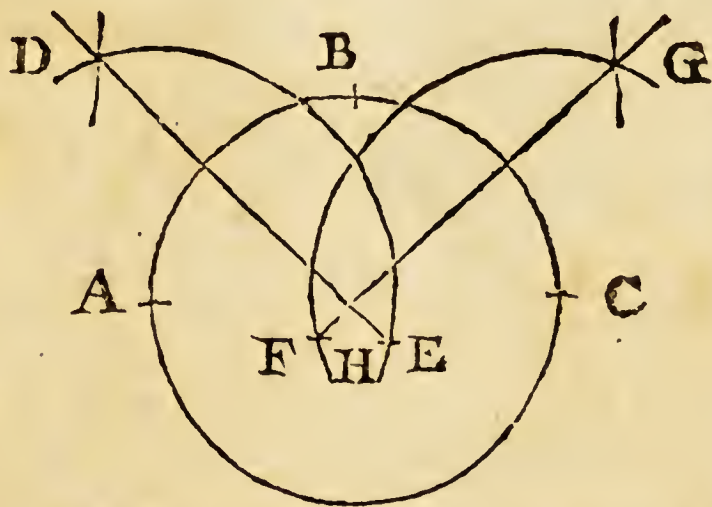
The Defcription of the Mariner's Compafs.

THIS Inftrument, fo beneficial an Affiftant to the *Practical Part* of
Navigation, as to its Inventor, is uncertainly difcourfed of; its Age,
by fome fuppofed to be in thefe Parts of the World about 300 Years;
the Utility whereof to us evidently appears, confidering the many In-
conveniencies that attended our Anceftors, in tracing the vaft Ocean,
for want of fuch a Guide, under whofe fubordinate Conduct of later
Years, our Maritime Affairs have fucceeded fo well.

It is a Circle of a greater or leffer Diameter at Pleafure, defcribed upon
a Pafte-board, and divided into 360 Degrees, and 32 Points, (and fome-
times into 24 Hours) each Point containing 11 deg. 15 min. or 3 quar-
ters of an Hour; as in the following Figure.

The Circle being thus divided upon the Card or Pafte-board, there
are pafted on the other Side of the faid Card or Pafte-board, two Wires,
which Wires being touched with a Loadftone, and the Card hung at the
Center upon a Pin, fix'd in a Box, its Pofition (Variation excepted) be-

comes North and South; and the said Box being cover'd with a Glass, is hung in another square Box, in such Manner that the Card may traverse, notwithstanding the Ship's Motion; and being thus fixed, it is ready for Use.

The Figure of the Mariner's Compass.
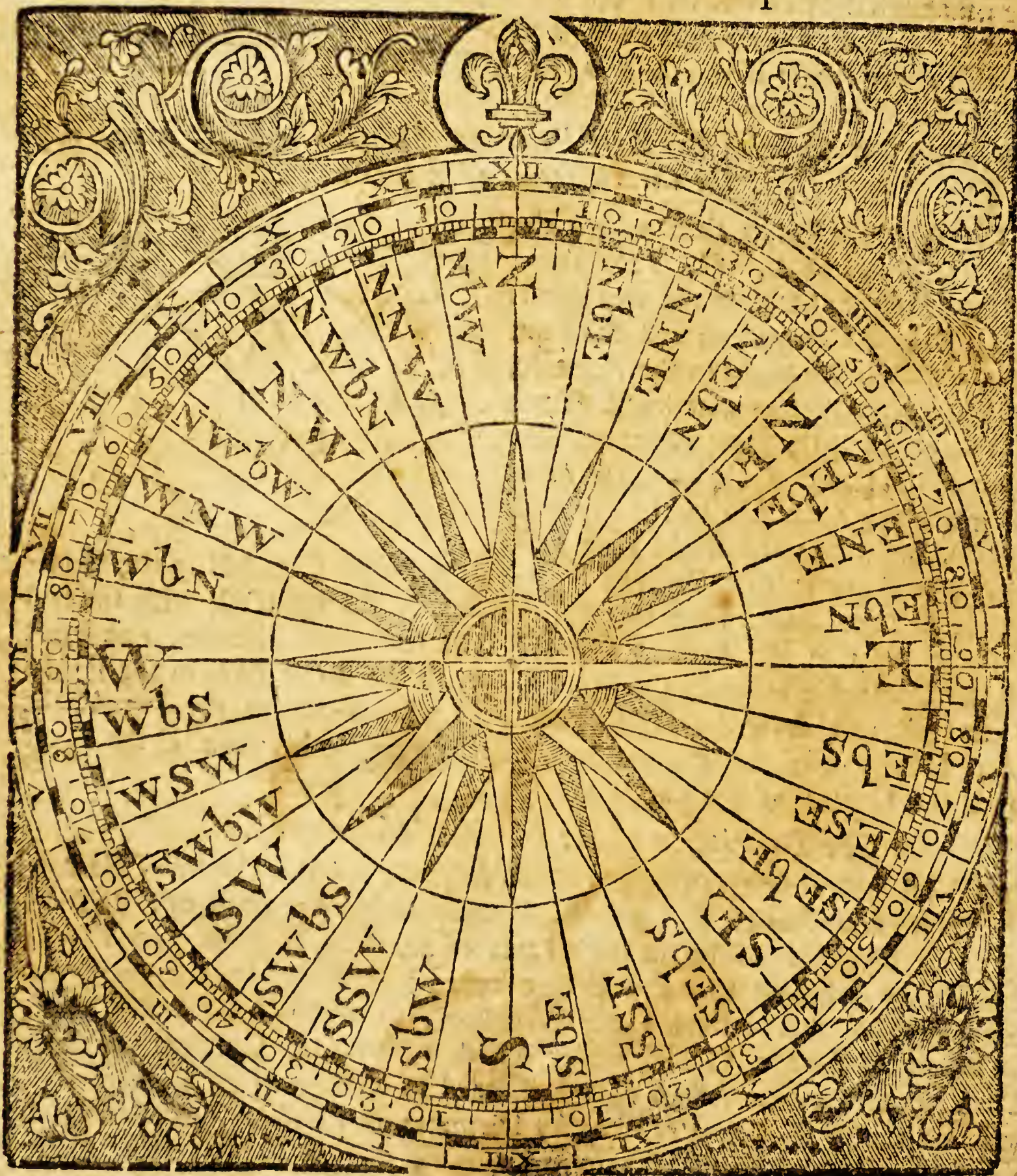
To find the Prime or Golden Number.

THE *Prime or Golden Number*, is a Revolution of Nineteen Years, in which Term the Moon returns to make the same Aspects with the Sun on the same Day of the Month (most commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains, the Prime is 19.

Example. To find the Golden Number for the Year 1762, add 1, which makes 1763; which divided by 19, the Quotient will be 92, and the Remainder 15, which is the Golden Number for the Year 1762.

N.B. The Golden Number is the same in both the Julian and Gregorian Account of Time.

To find the Epact.

THE Epact is the Number of Days which the Solar Year confisting of 365 Days, exceeds the Lunar (or twelve Revolutions of the Moon to the Sun) containing 354 Days, the Difference being 11 Days. When the Prime is 1, the Epact is 0; when 2, the Epact is 11; when 3, twice 11, or 22; when 4, thrice 11, or 33, or 3, omitting 30, (which muft conftantly be done when it exceeds 30;) and may be found in the following Manner.

Subtract 1 from the Prime, Multiply the Remainder by 11, and divide that Product (if it exceeds 30) by 30; the Remainder will be the Epact.

Example. Suppofe it were to find the Epact for the Year 1762.

The Prime for the Year 1762 is —————— 15
From which fubtract ———————————— 1
The Remainder is ——————————— 14
Which multipiled by ——————————— 11
The Product is ——————————— 154

This Product being divided by 30, the Quotient will be 5, and the Remainder 4, which is the Epact required.

Note; After the Year 1799, there will require a different Method to find the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June,* 4, for *July* 5, for *Auguft* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: Thefe three Sums added together, if lefs than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age fubtracted from 30, leaves the Day of the Change. Again, 15 added to, or fubtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppofe it was required to find the Moons Age for the firft Day of *April,* 1764.

First fet down the Epact for that Year —————— 26
To which add the Number for the Month, which is— 2
To that add the Day of the Mouth, which is——— 1
Sum, gives the Moon's Age———— 29

Then out of ——— 30
Take ————— 29 The Moon's Age.
Remains ———— 1 Day to the next Change.
Add ————— 15
Makes ———— 16 Days to next Full Moon. To

To find the Moon's Southing, and Time of Full-Sea, or High-Water The Reader is here referr'd to the Tide-Table, Page 32, &c. and the Use hereof immediately following.

To find the Dominical Letter.

Divide the Year and its fourth Part by 7, the Remainder subtracted from 7 gives the Dominical Letter; reckoning **A** for 1, **B** for 2, **C** for 3, **D** for 4, **E** for 5, **F** for 6, **G** for 7.

Suppose it was required to find the Dominical Letter for the Year 1762

First, Set down the Year ———— ———— ———— ———— 1762
Then the 4th Part, (the remainder 2 omitted, which denominates
    it to be the Second Year after Leap-Year,) is ———— } 440
The Sum is ———— ———— ———— ———— ———— ———— 2202

This Sum being divided by 7, the Quotient will be 314, and the Remainder 4, which being subtracted from 7, leaves 3; and consequently the Dominical Letter is C: But when it is Leap-Year, there will be two Dominical Letters, and then the Letter thus found serves from the last of *February* to the End of the Year; and the Letter before that, reckoning them backwards from G, is the Sunday Letter for the former part of the Year, to that Time.

N.B. After the Year 1799, the Order of the Dominical Letters, as they now range, will be disturbed, and consequently to find them, another Method must then take Place.

To find the Cycle of the Sun.

Add to the Year 9, divide the Sum by 28, the Remainder *is the* Cycle of the Sun.

Suppose it be required for the Year   1762
Then add ———— ———— ———— 9
Divided by ———— ——— ——— 28)1771(63
                      168
                       ·91
                       84
                    ·7

By the Operation it appears that 7 is the Cycle of the Sun for the Year 1762, being the Remainder after the Division.

Note, *Hillary* Terms begins *Jan.* 23. and ends *Feb.* 12.
Easter Term begins 17 Days after *Easter-day*, and ends *Monday* before *Whitsunday.*
Trinity Term begins on *Friday* after *Trinity Sunday*, and ends nineteen Days after.
Michaelmas Term begins *November* 6, and ends *November* 28.

Months		D.	H.		Months		D.	H.
January	New moon	6	9 M		*July*	New moon	2	8 M
	First quart.	14	3 M			First quart.	9	2 M
	Full moon	20	6 A			Full moon	17	4 M
	Last quart.	27	11 A			Last quart.	24	mid.
						New moon	31	3 A
February	New moon	5	3 M		*August*	First quart.	7	3 A
	First quart.	12	1 A			Full moon	15	7 A
	Full moon	19	6 M			Last quart.	23	8 M
	Last quart.	26	7 A			New moon	28	11 A
March	New moon	6	7 A		*September*	First quart	6	7 M
	First quart.	13	8 A			Full moon	14	10 M
	Full moon	20	7 A			Last quart.	21	2 A
	Last quart.	28	3 A			New moon	28	10 M
April	New moon	5	8 M		*October*	First quart.	6	2 M
	First quart.	12	2 M			Full moon	13	11 A
	Full moon	19	8 M			Last quart.	20	9 A
	Last quart.	27	11 M			New moon	27	10 A
May	New moon	4	6 A		*November*	First quart.	4	11 A
	First quart.	11	9 M			Full moon	12	11 M
	Full moon	18	11 A			Last quart.	19	5 M
	Last quart.	27	3 M			New moon	26	2 A
June	New moon	3	1 M		*December*	First quart.	4	7 A
	First quart.	9	5 A			Full moon	11	11 A
	Full moon	17	1 A			Last quart.	18	2 A
	Last quart.	25	3 A			New moon	26	8 M

Six Eclipses this Year, four of the Sun, and two of the Moon.

The first is of the Sun, *May* the 4th, invisible.
The second is of the Moon, *May* the 18th, visible 17 digits.
The third is of the Sun, *June* the 3d, invisible.
The fourth is of the Sun, *October* the 27th, invisible.
The fifth is of the Moon, *November* the 12th, invisible.
The sixth is of the Sun, *November* the 26th, invisible.

Months		D.	H.		Months		D.	H.
January	First quart	3	1 A		July	Full moon	6	5 A
	Full moon	11	10 M			Last quart.	14	9 M
	Last quart.	17	3 M			New moon	20	8 A
	New moon	25	4 M			First quart.	27	mid.
February	First quart.	2	3 M		August	Full moon	4	8 A
	Full moon	8	3 A			Last quart.	12	9 A
	Last quart.	15	6 A			New moon	19	4 A
	New moon	23	11 A			First quart.	26	10 M
March	First quart.	3	3 A		Septem.	Full moon	3	no on
	Full moon	10	7 M			Last quart.	11	8 M
	Last quart.	17	no on			New moon	17	mid.
	New moon	25	4 A			First quart.	24	mid.
April	First quart.	1	11 A		October	Full moon	3	4 M
	Full moon	8	5 A			Last quart.	10	6 A
	Last quart.	16	7 M			New moon	17	9 M
	New moon	24	6 M			First quart.	24	6 A
May	First quart.	1	6 M		November	Full moon	1	8 A
	Full moon.	8	4 M			Last quart.	9	2 M
	Last quart.	16	1 M			New moon	15	9 A
	New moon	23	4 A			First quart.	23	3 A
	First quart.	29	11 A			Full moon	31	11 M
June	Full moon	6	5 A		December	Last quart.	7	9 M
	Last quart.	14	6 A			New moon	15	11 M
	New moon	22	1 M			First quart.	23	no on
	First quart.	28	4 A			Full moon	21	mid.

Four Eclipses this Year, two of the Sun, and two of the Moon.
The first is of the Sun, *April* the 24th, invisible.
The second is of the Moon, *May* the 8th, visible 10 digits.
The third is of the Sun, *October* the 17th, visible 6 digits.
The fourth is of the Moon, *November* the 1st, visible 7 digits.

Months		D.	H
January	Laſt quart.	6	5 A
	New moon	14	4 M
	Firſt quart.	22	8 M
	Full moon	29	no on
February	Laſt quart.	5	4 M
	New moon	12	10 A
	Firſt quart.	21	1 M
	Full moon	27	11 A
March	Laſt quart.	6	3 A
	New moon	14	5 A
	Firſt quart.	22	4 A
	Full moon	29	8 M
April	Laſt quart.	5	6 M
	New moon	13	10 M
	Firſt quart.	21	2 M
	Full moon	27	4 A
May	Laſt quart.	4	10 A
	New moon	13	1 M
	Firſt quart.	20	8 M
	Full moon	27	1 M
June	Laſt quart.	3	3 A
	New moon	11	2 A
	Firſt quart.	18	1 A
	Full moon	25	11 M

Months		D.	H.
July	Laſt quart.	3	8 M
	New moon	10	mid.
	Firſt quart.	17	5 A
	Full moon	24	11 A
August	Laſt quart.	2	1 M
	New moon	9	8 M
	Firſt quart.	15	mid.
	Full moon	23	1 A
	Laſt quart	31	5 A
Septem.	New moon	7	5 A
	Firſt quart	14	8 M
	Full moon	22	5 M
	Laſt quart.	30	7 M
Octtober	New moon	7	1 M
	Firſt quart.	13	8 A
	Full moon	21	10 A
	Laſt quart.	29	6 A
November	New moon	5	10 M
	Firſt quart.	12	noon
	Full moon	21	4 A
	Laſt quart.	28	5 A
December	New moon	4	9 A
	Firſt quart.	12	7 M
	Full moon	20	9 M
	Laſt quart.	27	2 A

Only Two Eclipſes this Year, and they are both of the Sun, and both inviſible.

The firſt is on the 13th of *April*, at 10 in the Morning.
The ſecond is on the 7th of *October*, at 1 in the Morning.

Months		D.	H.		Months		D.	H.
January	New moon	3	10M		*July*	First quart.	6	3 A
	First quart.	11	4M			Full moon	13	9M
	Full moon	19	1M			Last quart.	20	10 A
	Last quart.	25	10 A			New moon	28	9 A
February	New moon	2	1M		*August*	First quart	4	8 A
	First quart.	10	2M			Full moon	11	6 A
	Full moon	17	1 A			Last quart.	19	3 A
	Last quart.	24	6M			New moon	27	7M
March	New moon	2	5 A		*September*	First quart.	3	1M
	First quart.	10	10 A			Full moon	10	7M
	Full moon	17	mid.			Last quart.	18	10M
	Last quart.	24	3 A			New moon	25	5 A
April	New moon	1	10M		*October*	First quart.	2	8M
	First quart.	9	2 A			Full moon	9	10 A
	Full moon	16	9M			Last quart.	18	3M
	Last quart.	24	2M			New moon	25	2M
						First quart.	31	6 A
May	New moon	1	3 A		*November*	Full moon	8	4 A
	First quart.	9	1M			Last quart.	16	7 A
	Full moon	15	5 A			New moon	23	1 A
	Last quart.	22	3 A			First quart.	30	8 A
	New moon	30	7 A					
June	First quart.	7	9M		*December*	Full moon	8	noon
	Full moon	13	mi d.			Last quart.	16	7M
	Last quart.	21	5M			New moon	22	11 A
	New moon	29	9M			First quart.	30	1M

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Moon, *March* the 17th, visible 8 digits.

The second is of the Sun, *April* the 1st, visible 10 digits.

The third is of the Moon, *September* the 10th, invisible.

The fourth is of the Sun, *September* the 25th, invisible.

Months		D.	H		Months		D.	H.
January	Full moon	7	6 M		July	Full moon	2	mid.
	Last quart.	14	6 A			Last quart.	9	10 A
	New moon	21	11 M			New moon	18	2 M
	First quart.	28	9 A			First quart.	25	4 A
February	Full moon	5	11 A		August	Full moon	1	7 M
	Last quart.	13	2 M			Last quart.	8	1 A
	New moon	19	11 A			New moon	16	4 A
	First quart.	27	6 A			First quart.	23	11 A
						Full moon	30	4 A
March	Full moon	7	1 A		September	Last quart.	7	6 M
	Last quart.	14	10 M			New moon	15	4 M
	New moon	21	1 A			First quart	22	5 M
	First quart.	29	3 A			Full moon	29	3 M
April	Full moon	6	1 M		October	Last quart.	7	2 M
	Last quart.	12	5 A			New moon	14	5 A
	New moon	20	4 M			First quart.	21	11 M
	First quart.	28	8 M			Full moon	28	6 A
May	Full moon	5	10 M		November	Last quart.	5	9 A
	Last quart.	12	10 M			New moon	13	4 M
	New moon	19	8 A			First quart.	19	7 A
	First quart.	27	10 A			Full moon	27	11 M
June	Full moon	3	5 A		December	Last quart.	5	3 A
	Last quart.	10	10 M			New moon	12	3 A
	New moon	18	11 M			First quart.	19	6 M
	First quart.	26	8 M			Full moon	27	6 M

Six Eclipses this Year, four of the Sun, and two of the Moon.
The first is of the Sun, February the 19th, invisible.
The second is of the Moon, March the 7th, invisible.
The third is of the Sun, March the 21st, invisible.
The fourth is of the Sun, August the 16th, visible 3 digits.
The fifth is of the Moon, August the 30th, invisible.
The sixth is of the Sun, September the 15th, invisible.

Months		D.	H.		Months		D.	H.
January	Laſt quart.	4	8M		*July*	New moon	7	2M
	New moon	11	1M			Firſt quart.	15	5M
	Firſt quart.	17	9 A			Full moon	22	1M
	Full moon	26	1M			Laſt quart.	28	5 A
February	Laſt quart.	2	9 A		*Auguſt*	New moon	5	6 A
	New moon	9	noon			Firſt quart.	13	4 A
	Firſt quart.	16	3 A			Full moon	20	7M
	Full moon	24	7 A			Laſt quart	27	6M
March	Laſt quart.	4	7 M		*September*	New moon	4	9M
	New moon	10	10 A			Firſt quart.	12	1M
	Firſt quart.	18	10M			Full moon	18	3 A
	Full moon	26	11M			Laſt quart.	25	10 A
April	Laſt quart.	2	3 A		*October*	New moon	4	1M
	New moon	9	10M			Firſt quart.	11	3M
	Firſt quart.	17	5M			Full moon	18	2M
	Full moon	24	mid.			Laſt quart.	25	5 A
May	Laſt quart.	1	7 A		*November*	New moon	2	4 A
	New moon	8	11 A			Firſt quart	9	3 A
	Firſt quart.	16	mid.			Full moon	16	3 A
	Full moon	24	10M			Laſt quart.	24	2 A
	Laſt quart.	31	1M		*December*	New moon	2	5M
June	New moon	7	noon			Firſt quart.	8	11 A
	Firſt quart.	15	4 A			Full moon	16	6M
	Full moon	22	5 A			Laſt quart.	24	11M
	Laſt quart.	29	8 M			New moon	31	5 A

Four Eclipſes this Year, two of the Sun, and two of the Moon.
The firſt is of the Sun, *February* the 9th, inviſible.
The ſecond is of the Moon, *February* 24th, viſible 4 digits.
The third is of the Sun, *Auguſt* 5th, viſible 11 digits.
The fourth is of the Moon, *Auguſt* 20th, inviſible.

Months		D.	H.		Months		D.	H
January	First quart	7	8 M		July	First quart.	4	7 M
	Full moon	15	1 M			Full moon	11	4 A
	Last quart.	23	7 M			Last quart.	14	8 M
	New moon	30	3 M			New moon	25	7 A
February	First quart.	5	8 A		August	First quart.	2	11 A
	Full moon	13	7 A			Full moon	10	1 M
	Last quart.	21	9 A			Last quart.	16	3 A
	New moon	28	2 A			New moon	24	9 M
March	First quart.	7	10 M		Septem.	First quart.	1	1 M
	Full moon	15	2 A			Full moon	8	8 M
	Last quart.	23	9 M			Last quart.	15	1 M
	New moon	29	mid.			New moon	23	2 M
April	First quart.	6	3 M		October	First quart.	1	1 M
	Full moon	14	7 M			Full moon	7	5 A
	Last quart.	21	5 A			Last quart.	14	3 A
	New moon	28	9 M			New moon	22	7 A
						First quart.	30	11 M
May	First quart.	5	8 A		November	Full moon	6	3 M
	Full moon.	13	9 A			Last quart.	13	9 M
	Last quart.	20	1 A			New moon	21	1 A
	New moon	27	7 A			First quart.	28	7 A
June	First quart.	4	2 A		December	Full moon	5	2 A
	Full moon	12	9 M			Last quart.	13	6 M
	Last quart.	19	3 M			New moon	21	4 M
	New moon	26	6 M			First quart.	28	4 M

Three Eclipses this Year, two of the Sun, and one of the Moon.

The first is of the Sun, *February* the 9th, invisible.
The second is of the Moon, *July* the 11th, visible.
The third is of the Sun, *July* the 25th, invisible.

Months		D.	H.		Months		D.	H.
January	Full moon	4	4M		July	Laſt quart.	7	6M
	Laſt quart.	12	4M			New moon	14	2 M
	New moon	19	6 A			Firſt quart.	21	9 A
	Firſt quart.	26	noon			Full moon	29	2 A
February	Full moon	2	8 A		August	Laſt quart.	5	11 M
	Laſt quart.	11	mid.			New moon	12	1 A
	New moon	18	6M			Firſt quart.	20	3 A
	Firſt quart.	24	9 A			Full moon	28	1 M
March	Full moon	4	2 A		September	Laſt quart.	3	4 A
	Laſt quart.	11	6 A			New moon	11	3 M
	New moon	18	4 A			Firſt quart	19	7 M
	Firſt quart.	25	8M			Full moon	26	9 M
April	Full moon	2	8M		October	Laſt quart.	2	mid.
	Laſt quart.	10	8M			New moon	10	8 A
	New moon	17	1M			Firſt quart.	18	11 A
	Firſt quart.	23	9 A			Full moon	25	6 A
May	Full moon	2	1M		November	Laſt quart.	1	noon
	Laſt quart.	9	6 A			New moon	9	2·A
	New moon	16	9M			Firſt quart.	17	noon
	Firſt quart.	23	noon			Full moon	24	4M
	Full moon	31	3 A					
June	Laſt quart.	8	1M		December	Laſt quart.	1	4 M
	New moon	14	5 A			New moon	9	8M
	Firſt quart.	22	4M			Firſt quart.	16	11 A
	Full moon	30	4M			Full moon	23	3 A
						Laſt quart.	30	11 A

Six Eclipſes this Year, three of the Sun, and three of the Moon.

The firſt is of the Moon, *January* the 4th, viſible.
The ſecond is of the Sun, *January* the 19th inviſible.
The third is of the Moon, *June* the 30th, inviſible.
The fourth is of the Sun, *July* the 14th, inviſible.
The fifth is of the Sun, *December* the 9th, inviſible.
The ſixth is of the Moon *December* the 23d, inviſible.

Months	D.	H.		Months	D.	H
January New moon	8	1 M		**July** New moon	3	3 A
First quart	15	9 M		First quart.	10	7 A
Full moon	22	3 M		Full moon	18	10 A
Last quart.	29	8 A		Last quart.	26	7 M
February New moon	6	6 A		**August** New moon	1	11 A
First quart.	13	4 A		First quart.	9	11 M
Full moon	20	5 A		Full moon	17	11 M
Last quart.	28	5 A		Last quart.	24	1 A
				New moon	31	10 M
March New moon	8	6 M		**Septem.** First quart.	8	5 M
First quart.	14	mid.		Full moon	15	11 A
Full moon	22	9 M		Last quart.	22	6 A
Last quart.	30	1 A		New moon	29	10 A
April New moon	6	5 A		**October** First quart.	8	1 M
First quart.	13	8 M		Full moon	15	10 M
Full moon	21	1 M		Last quart.	22	1 M
Last quart.	29	5 M		New moon	29	2 A
May New moon	6	1 M		**November** First quart	6	7 A
First quart.	12	5 A		Full moon	13	8 A
Full moon.	20	5 A		Last quart.	20	noon
Last quart.	28	5 A		New moon	28	8 M
June New moon	4	9 M		**December** First quart.	6	noon
First quart.	11	5 M		Full moon	13	6 M
Full moon	19	9 M		Last quart.	20	1 M
Last quart.	27	1 M		New moon	28	3 M

Five Eclipses this Year, three of the Sun, and two of the Moon.
The first is of the Sun, *January* the 8th, invisible.
The second is of the Sun, *June* the 4th, visible 7 digits.
The third is of the Moon, *June* the 19th, invisible.
The fourth is of the Sun, *November* the 28th invisible.
The fifth is of the Moon, *December* the 13th, visible 6 digits.

The Ufe of the foregoing Tables of the Moon's Age.

IN the faid Tables the one half Page contains the firft fix Months of the Year, the other half the following fix Months; in the firft Column of each half, towards the Left-hand are the Months; in the fecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the faid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A fignifying Afternoon, M Morning : At the Bottom of each Table are the Eclipfes for the refpective Year.

The Ufe of the Tables is, readily by Infpection, to find the Day and Hour of the New, Full, or Quarters of the Moon.

Examp. 1. Suppofe it was defired to find the Time of New Moon, *Jan.* 1764. Firft look for the Year 1764 on the Top of the Leaf, which having found, look for *January* in the firft Column towards the Left-hand ; then in the next Column in the fame Month is found New Moon; and in the two following Columns againft New Moon ftands 3d. 10h. M. which fhews that the New-moon in *January* 1764 is the 3d Day at 10 o'Clock in the Morning. The fame Directions ferve for the Full Moon, or firft and laft Quarter.

To find the Moon's Age fubtract the Day of the Change or New Moon from the Day propofed, the Remainder is the Moon's Age : Suppofe therefore it was required to find the Moon's Age for *December* 27, 1764.

Looking in the Year 1764, the Table gives the New Moon for *Dec.* to be on the twenty-fecond Day, therefore 22 being fubtracted from 27, there remains 5, whereby it appears the Moon is 5 Days old on the 27th of *December* in the Year 1764.

Example. Suppofe it were required to find the Moon's Age on the 1ft of *November*, 1765.

The laft New Moon before *Nov.* 1ft was *Oct.* 14th, but becaufe you cannot take 14 from 1, you muft add 31 (the Number of Days in *Oct.*) and from the Sum 32 fubtract 14 ; The Remainder 18 is the Moon's Age required.

A TIDE-TABLE *for the Sea Coafts of* Great-Britain, Ireland, Norway, Holland, Flanders, France, Bifcay, *&c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, rang'd in Alphabetic Order.*

A	H	M		H	M
AT *Army* NNE. and SSW.	01	30	At *Albarmorich* & *Antwerp*; Eaft and Weft ————	06	00
At *Amfterdam* & *Armentiers*, NE. and SW. ———	03	00	At *Alborough*, SE. by S. and NW. by N. ———	09	45
At *Abarwark*, ENE. and WSW. —————	04	30			

At

	H.	M
B		
At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, or *Blanchart*, N and S. ———	12	00
Thwart of *Beachy* in the Offing, N by E. and S by W. —	00	45
At *Blackness*, in *Bluet*, at *Bell-Isle*, NNE. and SSW. ———	01	30
Without *Bluet*, and at *Berwick*, NE by N. & SW by S.	02	15
The River of *Bourdeaux*, the South Coast of *Bretagne*, the Coast of *Biscay*, and at *Bochness*, NE. and SW. ———	03	00
At *Brest*, before the *Base*, the River of *Bourdeaux* within the Haven, NE by E. & SW by W.	03	45
In the *Breesound*, *Bloy*, *Baltimore*, ENE. and WSW. —	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, E. and W.———	06	00
At *Bristol* Key, E by S. and W by N. ———	06	45
At *Bridgwater*, E S E. and W N W.———	07	30
At *Boulogne-deep*, SSE & NNW	10	30
C		
In *Condado*, N. and S.——	12	00
In the *Chamber of Rye*, N by E. and S by W. ———	00	45
Without *Calais*, at *Corpus Christi* Point, before and at *Camfer*, NNE. and SSW. —	01	30
Between *Calais* and *Dover*, before *Conquet*, and at the North Cape, NE. and SW. ———	03	00
At *Cork*, *Calais*, C. *Clear* and in the *Creek*, ENE. and WSW.	04	30
At *Caldy*, and in the Bay of *Carmarthen*, E by N & W by S.	05	15
At *Concale*, E. and W.——	06	00
Without the *Caskets*, in the Channel, SE by S. and NW by W. ———	08	15

	H.	M
Between *Guernsey*, and the *Caskets*, before *Cromer*, before the *Caskets* and *Guernsey*, Seven Clifts, and at *Catness*, SE. and NW. ———	09	00
At the *Caskets*, and at *Chamberness*, SE by S. & NW by N.	09	45
At *Cows*, in the *Foss of Caen*, in *Calais-Road*, and in *Chamberness-Road*, SSE and NNW. —	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripplesand* and the *Creyl*, and at *Calshot*, S by E. and N by W. —	11	15
D		
At *Dover-Pier*, and before *Dunkirk*, N and S. ———	12	00
At *Denbeigh* & *Downs* in the Road, NE by N. & SW by S.	02	15
At *Dort*, NE and SW·——	03	00
At *Dungervan*, ENE. and WSW. ———	04	30
At *Dartmouth*, E. and W.	06	00
At *Dublin*, S E by E. and NW by W. ———	08	15
At *Dunbar*, SE. and NW.	09	00
At *Dungeness* and *Dunnose*, SE by S. and NW by N.——	09	45
At *Dover*, *Dieppe*, and in the Downs a-shore S S E. and N NW. ———	10	30
E		
At *Embden*, before the *Elb*, before the *Eyder*, and before *Enchusan*, N. and S.———	12	00
At *Edam*, NNE. and SSW.	01	30
Before the Eastern & Western *Emes*, and at *Engomonts*, SE. and NW. ———	09	00
F		
On the Coast of *Flanders*, N. and S.———	12	00
At *Flushing*, N by E. and S by W. ———	00	45
E Before		

	H.	M
Before the *Fen*, in the Channel, NNE. and SSW. ———	01	30
Without *Fountny*, NE by N. and SW by S. ———	02	15
Without the Banks of *Flanders*, NE. and SW. ———	03	00
At *Flamborough* and *Bridlington*, ENE and WSW. ———	04	30
At the *Forn* in *Foy*, at *Falmouth*, E by N. and W by S.	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulness*, E by S. and W by N. —	06	45
Before the Coast of *Frizeland* and the *Fly*, ESE. and WNW. ———	07	30
Without the *Fly*, SE by E. and NW by W. ———	08	15
At *Frize* and *Fair-Isle*, NW. and SE. ———	09	00
At the *Frith*, and at the *South Foreland*, SSE. and NNW. —	10	30
In *Fair Isle Roads*, and at the *North Foreland*, S by E. and N by W. ———	11	15

G

	H.	M
In the Road of *Gibralter*, at *Graveling*, and before *Cherburg*, N and S. ———	12	00
Before *Goeree*, at *Guernsey*, and at *Gravesend*, NNE. and SSW. ———	01	30
At *Groin*, at *Gascoign*, and the Coast of *Galicia*, NE. and SW. ———	03	00
Between *Guernsey* & *Caskets*, SE. and NW. ———	09	00
Thwart of *Guernsey* in the Channel, SE by S. and NW. by N. ———	09	45
In the *Chamber* and *Gocree-end*, S by E. and N by W. —	11	15

H

Before the *Hever*, before

	H.	M
Horn, and at *Hampton*-Key, N and S. ———	12	00
Under *Holy* Island, and at *Horn*, NNE. and SSW. —	01	30
Before *Hartlepool*, NE. and SW. ———	03	00
At *Huntcliff-foot*, NE by E. and SW by W. ———	03	45
At *Humber*, E by N. & W by S.	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, E and W. —	06	00
At *Harlem*, *Havre de Grace*, and *Homehead*, SE and NW.	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich*, SSE. and NNW. —	10	30
At *Harwich* within, S by E. and N by W. ———	11	15

I

	H.	M
At *Jutland* Islands, N. and S.	12	00
On the West Coast of *Ireland*, NE. and SW. ———	03	00
In all the Havens of the South Coast of *Ireland*, E by N. and W by S. ———	05	15

K

	H.	M
Kentish Knock, N. and S. —	12	00
At *Kelliers*, NE. and SW. —	03	00
At *Kingsale*, ENE & WSW.	04	30
At *Kilduyn*, ESE & WNW.	07	30
At *Keldive*, SE and NW.	09	00

L

	H.	M
At *Leith*, North and South	12	00
At *Lisbon*, NE by N. and SW by S. ———	02	15
At *London*, NE and SW. —	03	00
Thwart of *Londey*, and before *Lynn*, E by N. and W by S. ———	05	15
At *Lynn* Half-Tide, at *Londey*, East and West ———	06	00
At *Lynn*, E by S. and W by N. ———	06	45

At

	H.	M
At the *Lizard* by the Land, ESE. and WNW. ——	07	30
At *Lambay,* SE. by E. and NW by W. ————	08	15
At *Leostaff,* and thwart of it without the Banks, SE by S. and NW by N. ————	09	45
In *Leostaff-Road* and at *Longsand-head,* SSE. and NNW. —	10	30
M.		
Within the *Maes,* at *Maldon,* N by E. and S by W. ———	00	45
Before the *Maes,* NNE. and SSW. ————————	01	30
At the *Maes,* and before St. *Matthew's* Point, NE by E. and SW by W. ————	03	45
In *Mousehole,* at St. *Matthew's,* and within *Mount's-bay,* ENE. and WSW. ————	04	30
In *Milford,* at *Moonless,* at St. *Maloes,* E by N. and W by S.	05	15
Between *Mousehole* and *Falmouth,* and in *Milford-Haven,* ESE. and WNW. ———	07	30
In St. *Magnes* Sound, and at *Magnes* Castle, SE. by E. and NW by W. ————	08	15
At the *Isle of Man,* SE & NW	09	00
Before *Maregate,* S by E. and N by W. ————	11	15
N.		
At *Newport* Half-tide, N & S	12	00
At the West-end of the *Nore,* N by E. and S by W.———	00	45
Before the River of *Nantz,* NE. and SW. ————	03	00
At *Newcastle,* E by N & W by S.	05	15
Before St. *Nicholas,* E by S. and W by N. ————	06	45
At the *Needles,* at the Isle of *Wight,* SE by E. & NW by W.	08	15
All the Coast of *Normandy,* and *Picardy,* SSE. and NNW.	10	30

	H	M
Between the *Naze* and *Warhead* of *Lower,* S by E & N by W.	11	15
O		
At *Orkness,* NE and SW.—	03	00
At *Orkney,* SE and NW.—	09	00
At *Orfordness,* SE by S. and NW by N. ———————	09	45
At *Orfordness,* without the Banks, and between *Orford* and *Orwell Waves,* SSE. & NNW.	10	30
At *Orfordness,* within the Sands, S by E. and N by W.	11	15
At *Ostend,* N and S. ——	12	00
P		
At *Portsmouth* Half-Tide, N by W. and S by E. ——	11	15
At the *Pens, Porthus,* and *Poictu,* NE and SW. ———	03	00
On the Coast of *Portugal,* NE by E. and SW by W. —	03	45
In *Plymouth,* and before St. *Paul's,* E by N. and W by S.	05	15
At St. *Paul's,* in the Haven, E and W. ————————	06	00
Before *Podessemeck,* E by S. and W by N. —————	06	45
Thwart of *Plymouth,* ESE. and WNW. —————	07	30
At the Race of *Portland,* SE. and NW. ————————	09	00
Q		
At *Queenborough,* N. and S.	12	00
R		
At *Rochester,* N by E & S by W	00	45
At *Ramkins,* NNE. & SSW.	01	30
At *Rotterdam* in *Robin-Hood's* Bay, and from the Race to the Pole-head, NE. and SW. ——	03	00
At *Rouen,* and before *Rochel,* NE by E. and SW by W. —	03	45
In *Ramsey,* E by N & W by S.	05	15
S		
In the *Sleeve,* between *Ushant* and *Scilly,* at the *Shoe,* at the		

	H	M
Spits, at *Southampton*, and along the *Swin*, North and South —	12	00
Upon the Coaft of *Spain*, and in *Shetland*, NE. and SW. —	03	00
At *Scilly*, the *Sound*, *Scarborough* & at *Staples*, NEbyE&SWbyW	03	45
At *Seven Ifles*, without the Haven, in the *Broad Sound*, ENE. and WSW. ———	04	30
At the *Mouth* of *Severn* between *Scilly* & the *Lizard*, at the *Spurn* and *Stockton*, E byN. &W by S.	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E. and W.	06	00
At *Sedmouth*, and at the *Start*, E by S. and W by N. ———	06	45
Off the *Start* in the Channel, ESE. and WNW. ———	07	30
Within the *Seine*, and before *Shelbergh*, at 7 *Clifts*, SE&NW.	09	00
At *Shoran*, SE by S & NWbyN	09	45
At *Seine-head*, SSE. & NNW.	10	30

T

	H	M
Within *Tervere*, N by E. & S by W. ——— ———	00	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE. and SSE. ——	01	30
Before the *Tees* and *Tinmouth* before the Bay of *Tinmouth*, NE. and SW. ———	03	00
At the Cliffs off the *Texel*, ENE. and WSW. ———	04	30
In *Torbay*, and before the *Texel*, E. and W. —— ——	06	00
In the Road of the *Texel*, ESE. and WNW. ———	07	30
At *Torgen*, SE. by S. and NW by N. ——— ———	09	45

U

	H	M
Before *Ureck*, N. and S.	12	00
At *Ufe*, NE. and S.W ——	03	00
Between *Ufhant*, and the Main, NE byE. & SW by W.	03	45

	H	M
In the *Vourd*, at the Bay, within *Ufhant*, ENE & WSW.	04	30
Without *Ufhant*, E and W.	06	00
St. *Vallery*, SSE. & NNW.	10	30

W

	H	M
At *Winchelfea*, N by E. and S by W. ———	00	45
At the *Weilings*, and from the Weft-end of the *Wight*, NNE. and SSW. ———	01	30
Before the *Weilings*, NE by N. and SW by S. ———	02	15
At *Whitby*, NE. and SW.	03	00
In the Sea of *Wales*, and *Severn*, ENE. and WSW. ——	04	30
In *Wales*, E by N & W by S.	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E. and W.——	06	00
At *Weymouth* Key, E by S. and W by N. ———	06	45
At the *Nefs*, by *Wieringhen*, at *Winterton*, ESE. and WNW.	07	30
Thwart of the Ifle of *Wight*, in the Channel, all within the Ifle of *Wight*, between the Ifle of *Wight*, and *Beachy*, by the fhore, SE by E. & NW by W.	08	15
At the E. end of the *Wight*, and on *Wieringhen* Flats, SE and NW. ——— ———	09	00

Y

	H	M
Before *Yarmouth*, NNE. & SSW. ———	01	00
At *Youghall*, ENE. and W. SW. ———	04	30
At *Yarmouth*, SE by E. and NW by W. ———	08	15
In *Yarmouth* Road, in *Yarmouth* Haven, SSE. & NNW.	10	30

Z

	H	M
On the Coaft of *Zealand*, NNE. and SSW. ———	01	30
In the *Zurick-fea*, NE&SW.	03	00

T H.E forgeoing Table fhews the Time of Full Sea at the feveral Places therein contained, upon the Full and Change Days of the Moon, which for more ready Ufe it is put in Alphabetic Order.

Example, Admit the Time of Full Sea at *London*, upon the Full and Change Days, be required.

Look into the Table under the Letter (L) it is found to flow at *London* North Eaft and South Weft; that is, when it is Full Sea at *London*, the Moon will be, as it is vulgarly faid, upon the North Eaft and South Weft Points of the Compafs, which is four Points, or 3 Hours.

The Ufe of this, together with the Moon's Southing, to find the Time of Full Sea at any Time, at any of the faid Places is fhewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, the Quotient is the Time of Southing in Hours, and the Remainder is fo many 12 min. of an Hour.

Note, If the Moon's Age exceeds 15, reject the faid 15, and take the Remainder, with which proceed inftead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppofe the Time of the Moon's Southing be required on the 25th of *December*, 1763. The Moon's Age found to be 21 Days, rejecting 15, the Remainder 6, which multiplied by 4 makes 24, which divided by 5, gives the Quotient 4 Hours, 06 Minutes, which is the Time of the Moon's Southing, as was required, and the Remainder 4, is 48 in the Morning.

I fhall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.		Time H.	M.
1	16	0	48
2	17	1	36
3	18	2	24
4	19	3	12
5	20	4	00
6	21	4	48
7	22	5	36
8	23	6	24
9	24	7	12
10	25	8	00
11	26	8	48
12	27	9	36
13	28	10	24
14	29	11	12
15	30	12	00

The Ufe of the T A B L E.

The firft and fecond Columns fhews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old and her Southing required.

In the firft Column under the Title Moon's Age ftands 9; over againft it in the laft Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note alfo, The fame Southing ferves for 24 Days old which ferves for 9 Days, as the Table fhews; only obferve that if the Moon be under 15 Days old, her Southing is in the Afternoon, but if above that Age, then in the Morning.

Thus

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppose the Moon to be 9 Days old, the Time of Full Sea in the *Downs*-a-shore, is required.

By the foregoing Table it appears that a NNW. and SSE. Moon makes full Sea, which as the said Table shews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes (rejecting 12 Hours) in the Morning.

But to be more exact use the following Table and Directions.

Moon's Age.	Time H. M.
1——16	0——43
2——17	1——20
3——18	1——52
4——19	2——22
5——20	2——52
6——21	3——26
7——22	4——7
8——23	4——55
9——24	5——50
10——25	6——53
11——26	7——59
12——27	9——4
13——28	10——8
14——29	11——5
15——30	00——0

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpose, enter this Table with the Moon's Age: Against which in the last Column are the Hours and Minutes to be added for the Time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* a-shore is required.

A NNW. and SSE. Moon makes full Sea upon the Full and Change Days, which is 10 Hours 30 Minutes, this found enter the opposite Table with the Moon's Age 9 Days, against which stands 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning

Here follows

A New and Exact CALENDAR

OF

The Golden Number, Epact and Moveable Feasts, until the Year 1785; *as also of the Sun's Place and Declination to every Day of the Year, for the First, Second, Third, and Leap-Year, calculated for, and from the Year* 1760, *and made to serve (without any considerable Error) till the Year* 1775. *Likewise the Sun's Rising, whereby may be found the Time of the Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.*

A TABLE of the Dominical-Letters, Cycle of the Sun, Prime, Epact, and Moveable Feasts, for 26 Years to come.

Years.	Dom. Letter	Cycle of ☉	Prime	Epact	Shrove-Sunday.		Easter-Sunday.		Whit-Sunday.	
1760	F E	5	13	12	February	17	April	6	May	25
1761	D	6	14	23		1	March	22		10
1762	C	7	15	4		21	April	11		30
1763	B	8	16	15		13		3		22
1764	A G	9	17	26	March	4		22	June	10
1765	F	10	18	7	February	17		7	May	26
1766	E	11	19	18		9	March	30		18
1767	D	12	1	0	March	1	April	19	June	7
1768	C B	13	2	11	February	14		3	May	22
1769	A	14	3	22		5	March	26		14
1770	G	15	4	3		25	April	15	June	3
1771	F	16	5	14		10	March	31	May	19
1772	E D	17	6	25	March	1	April	19	June	7
1773	C	18	7	6	February	21		11	May	30
1774	B	19	8	17		13		3		22
1775	A	20	9	28		26		16	June	4
1776	G F	21	10	9		18		7	May	26
1777	E	22	11	20		9	March	30		18
1778	D	23	12	1	March	1	April	19	June	7
1779	C	24	13	12	February	14		4	May	23
1780	B A	25	14	23		6	March	26		14
1781	G	26	15	4		25	April	15	June	3
1782	F	27	16	15		10	March	31	May	19
1783	E	28	17	26	March	2	April	20	June	8
1784	D C	1	18	7	February	22		11	May	30
1785	B	2	19	18		6	March	27		15

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap 1760 1768 ⊙ pla	Year 1764 1772 ⊙ dec	First 1761 1769 ☽ pla	Year 1765 1773 ☽ dec	Second 1762 1770 ⊙ pla	Year 1766 1774 ⊙ dec	Third 1763 1771 ⊙ pla	Year 1767 1775 ⊙ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♈	South	♈	South	♈	South	♈	South
1	A	Circumcision.	10 41	23 03	11 26	22 59	11 11	23 02	10 56	23 02
2	B	Sun r. 8. 5.	11 42	22 57	12 27	22 54	12 12	22 56	11 57	22 57
3	C		12 44	22 51	13 28	22 48	13 13	22 50	12 58	22 51
4	D		13 45	22 45	14 29	22 42	14 14	22 43	13 59	22 45
5	E		14 46	22 39	15 30	22 35	15 15	22 36	15 01	22 38
6	F	Epiphany.	15 47	22 33	16 31	22 27	16 17	22 29	16 02	22 31
7	G		16 48	22 26	17 33	22 19	17 18	22 21	17 03	22 23
8	A	Castor&Polux	17 49	22 18	18 34	22 11	18 19	22 13	18 04	22 15
9	B	Procyon.	18 51	22 10	19 35	22 03	19 20	22 05	19 05	22 07
10	C		19 52	22 01	20 36	21 54	20 21	21 56	20 06	21 59
11	D	Sun r. 7. 56.	20 53	21 52	21 37	21 45	21 22	21 47	21 07	21 50
12	E		21 54	21 42	22 38	21 35	22 23	21 37	22 08	21 40
13	F		22 55	21 32	23 39	21 25	23 25	21 27	23 10	21 30
14	G		23 56	21 22	24 40	21 15	24 26	21 16	24 11	21 19
15	A		24 57	21 11	25 41	21 05	25 27	21 05	25 12	21 08
16	B		25 58	21 00	26 43	20 54	26 28	20 54	26 13	20 57
17	C		26 59	20 48	27 44	20 42	27 29	20 42	27 14	20 45
18	D		28 00	20 36	28 45	20 29	28 30	20 30	28 15	20 33
19	E		29 02	20 23	29 46	20 16	29 31	20 18	29 16	20 20
20	F	Sol in Aqua.	♒ 03	20 10	♒ 47	20 02	♒ 32	20 05	♒ 17	20 07
21	G		01 04	19 57	01 48	19 48	01 33	19 51	01 18	19 54
22	A	Sun r. 7. 44	02 05	19 44	02 49	19 34	02 34	19 37	02 20	19 40
23	B		03 06	19 30	03 50	19 20	03 35	19 23	03 21	19 26
24	C		04 07	19 16	04 51	19 05	04 36	19 09	04 22	19 12
25	D	Conv.St.Paul	05 08	19 01	05 52	18 50	05 37	18 55	05 23	18 58
26	E		06 09	18 46	06 53	18 35	06 38	18 40	06 23	18 43
27	F		07 10	18 31	07 54	18 20	07 39	18 24	07 24	18 27
28	G		08 11	18 15	08 55	18 04	08 40	18 08	08 25	18 11
29	B		09 11	17 59	09 56	17 48	09 41	17 52	09 26	17 55
30	A	K.Charles M.	10 12	17 43	10 57	17 31	10 42	17 36	10 27	17 39
31	C		11 13	17 26	11 57	17 14	11 43	17 10	11 28	17 22

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap Year 1760 1768 / 1764 1772 ☉ pla D	M	☉ dec D	M	First Year 1761 1769 / 1765 1773 ☉ pla D	M	☉ dec D	M	Second Year 1762 1770 / 1766 1774 ☉ pla D	M	☉ dec D	M	Third Year 1763 1771 / 1767 1775 ☉ pla D	M	☉ dec D	M
			♒		South		♒		South		♒		South		♒		South	
1	D	Sun r. 7. 28.	12	14	17	09	12	58	16	57	12	44	17	01	12	29	17	05
2	E	Purif. Mary	13	15	16	52	13	59	16	40	13	44	16	44	13	30	16	48
3	F		14	16	16	35	15	00	16	22	14	45	16	26	14	31	16	31
4	G		15	16	16	17	16	01	16	04	15	46	16	08	15	31	16	13
5	A		16	17	15	59	17	01	15	56	16	47	15	50	16	32	15	55
6	B		17	18	15	41	18	02	15	27	17	47	15	32	17	33	15	36
7	C		18	19	15	23	19	03	15	08	18	48	15	13	18	33	15	18
8	D		19	19	15	04	20	03	14	49	19	49	14	54	19	34	14	59
9	E		20	20	14	45	21	04	14	30	20	50	14	35	20	35	14	40
10	F		21	21	14	25	22	05	14	11	21	50	14	15	21	35	14	20
11	G		22	22	14	05	23	05	13	52	22	51	13	56	22	36	14	00
12	A		23	22	13	45	24	06	13	32	23	51	13	36	23	37	13	40
13	B		24	23	13	25	25	06	13	12	24	52	13	16	24	37	13	20
14	C	Valentine,	25	23	13	05	26	07	12	51	25	52	12	55	25	38	13	00
15	D	Lyon's Heart	26	24	12	45	27	08	12	30	26	53	12	34	26	38	12	40
16	E	Lyon's Neck.	27	24	12	24	28	08	12	09	27	53	12	13	27	39	12	19
17	F	Sun r. 7. 6.	28	25	12	03	29	09	11	48	28	54	11	52	28	40	11	58
18	G		29	25	11	42	♓	09	11	27	29	54	11	31	29	40	11	37
19	A	Sol in Pisces	♓	25	11	21	01	09	11	05	♓	55	11	10	♓	40	11	16
20	B		01	26	10	59	02	10	10	43	01	55	10	49	01	41	10	54
21	C		02	26	10	38	03	10	10	22	02	55	10	27	02	41	10	32
22	D	Sun r. 6. 49.	03	27	10	16	04	10	10	00	03	56	10	05	03	41	10	10
23	E		04	27	09	54	05	11	09	38	04	56	09	43	04	41	09	48
24	F	St. Matthias	05	27	09	31	06	11	09	16	05	56	09	21	05	42	09	26
25	G		06	27	09	09	07	11	08	54	06	57	08	59	06	42	09	04
26	A	Lower of the	07	28	08	47	08	11	08	31	07	57	08	37	07	42	08	42
27	B	two Foremost	08	28	08	25	09	11	08	09	08	57	08	14	08	42	08	20
28	C	in □ of Great	09	28	08	02	10	12	07	46	09	57	07	51	09	42	07	57
		Bear.																
29	D		10	28	07	39												

When it is Leap-Year, Feb. hath 29 Days

[handwritten marginalia:] February 10 day 1740 Samuel Forster Age

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ⊙ pla		Year 1764 1772 ⊙ dec		First 1761 1769 ⊙ pla		Year 1765 1773 ⊙ dec		Second 1762 1770 ⊙ pla		Year 1766 1774 ⊙ dec		Third 1763 1771 pla		Year 1767 1775 ⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♓		South		♓		South		♓		South		♓		South	
1		David.	11	28	07	16	11	12	07	24	10	57	07	28	10	43	07	34
2			12	28	06	53	12	12	07	01	11	57	07	05	11	43	07	11
3			13	28	06	30	13	12	06	38	12	57	06	42	12	43	06	48
4		Sun r. 6. 29.	14	28	06	07	14	12	06	14	13	57	06	19	13	43	06	25
5			15	28	05	44	15	12	05	51	14	57	05	56	14	43	06	02
6			16	28	05	21	16	12	05	28	15	57	05	33	15	43	05	39
7			17	28	04	58	17	12	05	05	16	57	05	10	16	43	05	16
8			18	28	04	54	18	12	04	41	17	57	04	46	17	43	04	52
9			19	28	04	11	19	12	04	18	18	57	04	23	18	42	04	29
10			20	28	03	47	20	11	03	54	19	57	03	59	19	42	04	05
11		Sun r. 6. 14	21	27	03	24	21	11	03	30	20	57	03	36	20	42	03	42
12			22	27	03	00	22	11	03	06	21	56	03	12	21	42	03	18
13		Lyon's Tail.	23	27	02	37	23	11	02	42	22	56	02	49	22	42	02	55
14		Lower of two	24	26	02	13	24	10	02	19	23	56	02	25	23	41	02	31
15		latter in □ of	25	26	01	49	25	10	01	55	24	56	02	01	24	41	02	07
16		Great Bear.	26	26	01	25	26	09	01	32	25	55	01	37	25	41	01	43
17			27	25	01	01	27	09	01	08	26	55	01	14	26	40	01	20
18			28	25	00	38	28	09	00	44	27	54	00	50	27	40	00	56
19			29	24	00	14	29	08	00	21	28	54	00	26	28	39	00	33
20		Sol in Aries.	♈	24	Nor.	09	♈	08	Nor.	02	29	53	00	02	29	39	00	09
21		Upper of two	01	23	00	33	01	07	00	26	♈	53	Nor.	21	♈	38	Nor.	14
22		latter in □ of	02	23	00	56	02	06	00	50	01	52	00	44	01	38	00	38
23		great Bear.	03	22	01	20	03	06	01	14	02	51	01	08	02	37	01	02
24			04	21	01	44	04	05	01	37	03	51	01	32	03	36	01	26
25		Lady-Day.	05	21	02	08	05	04	02	01	04	50	01	56	04	36	01	50
26			06	20	02	31	06	04	02	24	05	49	02	19	05	35	02	13
27			07	19	02	54	07	03	02	48	06	48	02	43	06	34	02	37
28			08	18	03	17	08	02	03	11	07	48	03	06	07	33	03	00
29		Sun r. 5. 38.	09	17	03	41	09	01	03	35	08	47	03	30	08	33	03	24
30			10	16	04	04	10	00	03	58	09	46	03	53	09	32	03	47
31			11	16	04	27	11	00	04	21	10	45	04	16	10	31	04	10

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☽ pla		Year 1765 1773 ☽ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		North		♈		North		♈		North		♈		North	
1		Last but two	12	15	04	50	11	59	04	44	11	44	04	39	11	30	04	33
2		in great Bear's	13	14	05	13	12	58	05	07	12	43	05	02	12	29	04	56
3		Tail.	14	13	05	36	13	57	05	31	13	42	05	25	13	28	05	19
4		Sun. r. 5. 31.	15	12	05	59	14	56	05	54	14	41	05	48	14	27	05	42
5			16	10	06	22	15	55	06	17	15	40	06	11	15	26	06	05
6			17	09	06	45	16	53	06	39	16	39	06	33	16	25	06	28
7			18	08	07	08	17	52	07	02	17	38	06	56	17	24	06	51
8		Virgin's Spike	19	07	07	30	18	51	07	24	18	37	07	18	18	22	07	13
9		Last but one	20	06	07	52	19	50	07	46	19	35	07	41	19	21	07	35
10		in great Bear's	21	05	08	14	20	49	08	08	20	34	08	03	20	20	07	57
11		Tail.	22	03	08	36	21	48	08	30	21	33	08	25	21	19	08	20
12		Sun r. 5. 12.	23	02	08	58	22	46	08	52	22	32	08	47	22	17	08	42
13			24	01	09	20	23	45	09	14	23	30	09	09	23	16	09	04
14			24	59	09	42	24	43	09	35	24	29	09	30	24	15	09	25
15		Last in great	25	58	10	03	25	42	09	57	25	28	09	52	25	13	09	47
16		Bear's Tail.	26	56	10	24	26	41	10	18	26	26	10	13	26	12	10	08
17		Sun r. 5. 6.	27	55	10	45	27	39	10	39	27	25	10	34	27	10	10	29
18			28	53	11	06	28	38	11	00	28	23	10	55	28	09	10	50
19			29	52	11	27	29	36	11	21	29	22	11	16	29	07	11	11
20		Sol in Taurus	♉	50	11	47	♉	35	11	41	♉	20	11	37	♉	06	11	31
21		Sun r. 4. 55.	01	49	12	07	01	33	12	02	01	18	11	58	01	04	11	52
22		Dragon's Tail	02	47	12	27	02	31	12	22	02	17	12	18	02	03	12	12
23		St. George.	03	45	12	47	03	30	12	42	03	15	12	37	03	01	12	32
24		Arcturus.	04	44	13	07	04	28	13	02	04	13	12	57	03	59	12	52
25		St. Mark Evan	05	42	13	27	05	26	13	21	05	12	13	17	04	58	13	12
26			06	40	13	46	06	24	13	40	06	10	13	36	05	56	13	31
27			07	38	14	05	07	23	14	00	07	08	13	55	06	54	13	50
28		Day inc. 6.55	08	37	14	24	08	21	14	19	08	06	14	14	07	52	14	09
29			09	35	14	43	09	19	14	38	09	05	14	33	08	51	14	28
30			10	33	15	01	10	17	14	56	10	03	14	51	09	49	14	47

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ⊙ pla		Year 1764 1772 ⊙ dec		First 1761 1769 ⊙ pla		Year 1765 1773 ⊙ dec		Second 1762 1770 ⊙ pla		Year 1766 1774 ⊙ dec		Third 1763 1771 ⊙ pla		Year 1767 1775 ⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♉		North		♉		North		♉		North		♉		North	
1		Phil. & Jacob	11	31	15	19	11	15	15	14	11	01	15	09	10	47	15	05
2			12	29	15	37	12	13	15	32	11	59	15	27	11	45	15	23
3		Sun r. 4. 38.	13	27	15	54	13	11	15	50	12	57	15	45	12	43	15	41
4			14	25	16	11	14	09	16	07	13	55	16	03	13	41	15	59
5		Upper of two	15	23	16	28	15	07	16	24	14	53	16	20	14	39	16	16
6		foremost in □	16	21	16	45	16	05	16	41	15	51	16	37	15	37	16	33
7		of Little Bear	17	19	17	02	17	03	16	58	16	49	16	53	16	35	16	50
8		N. Scale of ♎	18	17	17	18	18	01	17	14	17	47	17	09	17	33	17	06
9			19	15	17	34	18	59	17	30	18	45	17	25	18	31	17	22
10			20	12	17	50	19	57	17	45	19	43	17	41	19	29	17	38
11			21	10	18	05	20	55	18	01	20	40	17	57	20	26	17	54
12			22	08	18	20	21	53	18	16	21	38	18	12	21	24	18	09
13		Sun r. 4. 17.	23	06	18	35	22	51	18	31	22	36	18	27	22	22	18	24
14		Brightest in	24	04	18	49	23	48	18	45	23	34	18	42	23	20	18	38
15		the Crown.	25	01	19	03	24	46	19	00	24	31	18	56	24	18	18	53
16		Brightest in	♊ 25	59	19	17	25	42	19	14	25	29	19	10	25	16	19	07
		Serpent'sneck																
17			26	57	19	31	26	41	19	27	26	27	19	24	26	14	19	20
18			27	54	19	44	27	39	19	40	27	25	19	37	27	11	19	33
19			28	52	19	57	28	37	19	53	28	22	19	50	28	08	19	46
20		Scorpion's Forehead.	29	50	20	09	29	34	20	06	29	20	20	03	29	06	19	59
21		Sol in Gemini	♊	47	20	21	♊	32	20	18	♊	18	20	15	♊ 04		20	12
22		Sun r. 4. 5.	01	45	20	33	01	29	20	30	01	15	20	27	01	01	20	24
23			02	42	20	44	02	27	20	41	02	13	20	38	01	59	20	36
24			03	40	20	55	03	24	20	52	03	10	20	49	02	56	20	47
25		Scorpion's	04	38	21	06	04	22	21	03	04	08	21	00	03	54	20	58
26		Heart.	05	35	21	16	05	20	21	14	05	06	21	11	04	51	21	09
27			06	32	21	26	06	17	21	24	06	03	21	21	05	49	21	19
28			07	30	21	36	07	15	21	34	07	00	21	31	06	46	21	29
29		K.C.II.B&R.	08	27	21	45	08	12	21	43	07	58	21	40	07	44	21	39
30		Sun r. 3. 55.	09	25	21	54	09	09	21	52	08	55	21	49	08	41	21	48
31			10	22	22	02	10	07	22	01	09	53	21	58	09	39	21	56

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☉ pla		Year 1765 1773 ☉ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♊		North		♊		North		♊		North		♊		North	
1		Sun r. 3. 52.	11	20	22	10	11	04	22	09	10	50	22	06	10	36	22	04
2			12	17	22	18	12	02	22	17	11	47	22	14	11	33	22	12
3			13	14	22	25	12	59	22	24	12	45	22	22	12	30	22	20
4			14	12	22	32	13	56	22	31	13	42	22	29	13	28	22	28
5		Sun. r. 3. 50	15	09	22	39	14	54	22	38	14	39	22	36	14	26	22	35
6			16	06	22	45	15	51	22	44	15	37	22	42	15	23	22	41
7			17	04	22	51	16	48	22	50	16	34	22	48	16	20	22	47
8			18	01	22	56	17	46	22	55	17	31	22	54	17	18	22	53
9			18	58	23	01	18	43	23	00	18	29	22	59	18	15	22	58
10			19	56	23	06	19	40	23	05	19	26	23	04	19	12	23	03
11			20	53	23	10	20	38	23	09	20	23	23	08	20	10	23	07
12		Sun r. 3. 48.	21	50	23	13	21	35	23	13	21	21	23	11	21	07	23	11
13			22	47	23	17	22	32	23	17	22	18	23	15	22	04	23	14
14			23	45	23	20	23	29	23	20	23	15	23	18	23	01	23	17
15			24	42	23	23	24	27	23	22	24	12	23	21	23	58	23	20
16			25	39	23	25	25	24	23	24	25	10	23	23	24	56	23	23
17			26	36	23	27	26	21	23	26	26	07	23	25	25	53	23	25
18			27	33	23	28	27	18	23	27	27	04	23	27	26	50	23	27
19			28	31	23	29	28	15	23	28	28	01	23	28	27	47	23	28
20			29	28	23	29	29	13	23	29	28	58	23	29	28	45	23	29
21		Sol in Cancer	♋	25	23	29	♋	10	23	29	29	56	23	29	29	42	23	29
22		Sun r. 3. 47.	01	22	23	29	01	07	23	29	♋	53	23	29	♋	39	23	29
23			02	20	23	28	02	04	23	28	01	50	23	28	01	36	23	28
24		John Baptist	03	17	23	27	03	02	23	27	02	47	23	27	02	33	23	27
25			04	14	23	25	03	59	23	25	03	44	23	26	03	31	23	26
26			05	11	23	23	04	56	23	23	04	42	23	24	04	28	23	24
27		Brightest in	06	08	23	20	05	53	23	21	05	39	23	22	05	25	23	22
28		the Harp.	07	06	23	17	06	50	23	18	06	36	23	19	06	22	23	20
29		Peter Apostle	08	03	23	14	07	47	23	15	07	33	23	16	07	19	23	17
30			09	00	23	11	08	45	23	11	08	30	23	13	08	17	23	13

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla D	M	Year 1764 1772 ☉ dec D	M	First 1761 1769 ☉ pla D	M	Year 1765 1773 ☉ dec D	M	Second 1762 1770 ☉ pla D	M	Year 1766 1774 ☉ dec D	M	Third 1763 1771 ☉ pla D	M	Year 1767 1775 ☉ dec D	M
			♋		North		♋		North		♋		North		♋		North	
1			09	58	23	07	09	42	23	07	09	28	23	09	09	14	23	09
2			10	55	23	02	10	39	23	03	10	25	23	04	10	11	23	05
3			11	52	22	57	11	36	22	59	11	22	22	59	11	08	23	01
4			12	49	22	52	12	33	22	54	12	19	22	54	12	05	22	56
5			13	46	22	46	13	30	22	48	13	16	22	49	13	02	22	51
6			14	43	22	40	14	28	22	42	14	13	22	43	14	00	22	45
7		Sun r. 3. 53.	15	40	22	34	15	25	22	35	15	11	22	37	14	57	22	39
8			16	38	22	27	16	22	22	28	16	08	22	30	15	54	22	32
9			17	35	22	20	17	19	22	21	17	05	22	23	16	51	22	25
10			18	32	22	12	18	16	22	14	18	02	22	16	17	48	22	18
11			19	29	22	04	19	14	22	06	18	59	22	08	18	40	22	10
12		Sun r. 3. 58.	20	26	21	55	20	11	21	58	19	57	22	00	19	43	22	02
13			21	23	21	46	21	08	21	49	20	54	21	51	20	40	21	53
14			22	21	21	37	22	05	21	40	21	51	21	42	21	37	21	44
15			23	18	21	28	23	03	21	31	22	48	21	33	22	34	21	35
16			24	15	21	18	24	00	21	21	23	46	21	23	23	32	21	26
17			25	12	21	08	24	57	21	11	24	43	21	13	24	29	21	16
18			26	10	20	57	25	54	21	00	25	40	21	03	25	26	21	05
19			27	07	20	46	26	52	20	49	26	37	20	52	26	24	20	54
20			28	04	20	35	27	49	20	38	27	35	20	41	27	21	20	43
21		Sun r. 4 4.	29	02	20	24	28	46	20	27	28	33	20	29	28	18	20	32
22		Sol in Leo	29	59	20	12	29	43	20	15	29	30	20	17	29	15	20	20
23			♌	56	19	59	♌	41	20	03	♌	27	20	05	♌	13	20	08
24			01	53	19	46	01	38	19	50	01	24	19	53	01	10	19	56
25		James Apostle	02	51	19	33	02	35	19	37	02	21	19	40	02	07	19	43
26			03	48	19	20	03	33	19	24	03	19	19	27	03	05	19	30
27		Sun r. 4. 16.	04	46	19	06	04	30	19	10	04	16	19	14	04	02	19	17
28		Swan's Tail.	05	43	18	52	05	29	18	56	05	13	19	00	04	59	19	03
29		Dog days be.	06	40	18	38	06	25	18	42	06	11	18	46	05	57	18	49
30			07	38	18	23	07	22	18	28	07	08	18	31	06	54	18	35
			08	35	18	08	08	20	18	13	08	06	18	16	07	52	18	20

Month Days	Week Days	Remarkable days, and souching of Stars at Midnight.	Leap 1760 1768 ⊙ pla D	M	Year 1764 1772 ⊙ dec D	M	First 1761 1769 ⊙ pla D	M	Year 1765 1773 ⊙ dec D	M	Second 1762 1770 ⊙ pla D	M	Year 1766 1774 ⊙ dec D	M	Third 1763 1771 ⊙ pla D	M	Year 1767 1775 ⊙ dec D	M
			♌		North		♌		North		♌		North		♌		North	
1		Lammas.	09	33	17	53	09	17	17	58	09	03	18	01	08	49	18	05
2		Sun r. 4. 20.	10	30	17	38	10	15	17	43	10	01	17	46	09	47	17	50
3			11	28	17	22	11	12	17	27	10	58	17	30	10	44	17	34
4			12	25	17	06	12	10	17	11	11	55	17	14	11	42	17	18
5			13	23	16	50	13	07	16	55	12	53	16	58	12	39	17	02
6			14	20	16	33	14	05	16	38	13	51	16	42	13	37	16	46
7			15	18	16	16	15	02	16	21	14	48	16	25	14	34	16	29
8			16	15	15	59	16	00	16	04	15	46	16	08	15	32	16	12
9			17	13	15	42	16	58	15	47	16	43	15	51	16	29	15	55
10			18	11	15	24	17	55	15	29	17	41	15	33	17	27	15	38
11		Sun r. 4. 35.	19	08	15	06	18	53	15	11	18	38	15	16	18	24	15	20
12			20	06	14	48	19	50	14	53	19	36	14	58	19	22	15	02
13		Sun r. 5. 39.	21	04	14	30	20	48	14	35	20	34	14	40	20	20	14	44
14			22	01	14	11	21	46	14	17	21	31	14	21	21	18	14	26
15			22	59	13	53	22	44	13	58	22	29	14	02	22	15	14	07
16			23	57	13	34	23	41	13	39	23	27	13	43	23	13	13	48
17			24	55	13	15	24	39	13	20	24	25	13	24	24	11	13	29
18			25	52	12	55	25	37	13	00	25	22	13	05	25	09	13	10
19			26	50	12	36	26	35	12	41	26	20	12	45	26	06	12	50
20			27	48	12	16	27	33	12	21	27	18	12	25	27	04	12	30
21		Sun r. 4. 53.	28	46	11	56	28	30	12	01	28	16	12	05	28	02	12	10
22			29	44	11	35	29	28	11	41	29	14	11	45	29	00	11	51
23		Sol in Virgo	♍	42	11	15	♍	26	11	21	♍	12	11	25	29	58	11	30
24		Barthol. Ap.	01	40	10	54	01	24	11	00	01	10	11	05	♍	56	11	09
25			02	38	10	33	02	22	10	39	02	08	10	44	01	54	10	49
26			03	36	10	12	03	20	10	18	03	06	10	23	02	52	10	28
27			04	34	09	51	04	18	09	57	04	04	10	02	03	50	10	07
28			05	32	09	30	05	16	09	36	05	02	09	41	04	48	09	46
29			06	30	09	09	06	14	09	15	06	00	09	20	05	46	09	25
30		Sun r. 5. 13.	07	28	08	47	07	12	08	53	06	58	08	58	06	44	09	04
31			08	26	08	25	08	10	08	31	07	56	08	36	07	42	08	42

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ⊙ pla	Year 1764 1772 ⊙ dec	First 1761 1769 ⊙ pla	Year 1765 1773 ⊙ dec	Second 1762 1770 ⊙ pla	Year 1766 1774 ⊙ dec	Third 1763 1771 ⊙ pla	Year 1767 1775 ⊙ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♍	North	♍	North	♍	North	♍	North
1	F	Fomelhaut	09 24	08 03	09 09	08 09	08 54	08 14	08 40	08 20
2	G	London b. 66	10 22	07 41	10 07	07 47	09 53	07 52	09 38	07 58
3	A	First in Pega-	11 21	07 19	11 05	07 25	10 51	07 30	10 37	07 36
4	B	sus's Wing.	12 19	06 57	12 03	07 03	11 49	07 08	11 35	07 13
5	C		13 17	06 35	13 02	06 41	12 47	06 46	12 33	06 51
6	D		14 16	06 12	14 00	06 19	13 46	06 24	13 32	06 29
7	E	Sun r. 5. 28.	15 14	05 50	14 58	05 56	14 44	06 01	14 30	06 07
8	F	Dog days end	16 12	05 27	15 57	05 33	15 42	05 38	15 28	05 44
9	G		17 11	05 04	16 55	05 10	16 41	05 16	16 27	05 22
10	A		18 09	04 41	17 54	04 47	17 39	04 53	17 25	04 59
11	B		19 08	04 18	18 52	04 24	18 38	04 30	18 24	04 36
12	C	Sun r. 5. 35.	20 06	03 55	19 51	04 01	19 36	04 07	19 22	04 13
13	D		21 05	03 32	20 49	03 38	20 35	03 44	20 21	03 50
14	E		22 04	03 09	21 48	03 15	21 33	03 21	21 19	03 27
15	F		23 02	02 46	22 46	02 52	22 32	02 58	22 18	03 04
16	G		24 01	02 23	23 45	02 29	23 30	02 35	23 16	02 40
17	A	Sun r. 5. 49	24 59	02 00	24 44	02 06	24 29	02 11	24 15	02 17
18	B		25 58	01 36	25 42	01 43	25 28	01 47	25 14	01 53
19	C		26 57	01 13	26 41	01 20	26 26	01 24	26 12	01 30
20	D	Andro. head	27 56	00 49	27 40	00 56	27 25	01 01	27 11	01 07
21	E	Mathew Evan	28 55	00 26	28 38	00 33	28 24	00 38	28 10	00 44
22	F	Sun r. 6. 0. }	29 53	00 02	29 37	00 09	29 23	00 14	29 09	00 20
23	G	Sol in Libra }	♎ 52	Sou. 21	♎ 36	Sou. 14	♎ 22	Sou. 09	♎ 07	Sou. 03
24	A	End of Pega-	01 51	00 44	01 35	00 38	01 21	00 32	01 06	00 26
		sus's Wing.								
25	B		02 50	01 08	02 34	01 01	02 20	00 56	02 05	00 50
26	C		03 49	01 31	03 33	01 25	03 19	01 19	03 04	01 13
27	D		04 48	01 55	04 32	01 48	04 18	01 43	04 03	01 37
28	E	Sun r. 6. 9.	05 47	02 18	05 31	02 12	05 17	02 06	05 02	02 00
29	F	St. Michael.	06 46	02 41	06 30	02 36	06 16	02 29	06 01	02 23
30	G		07 45	03 05	07 29	03 59	07 15	02 52	07 01	02 46

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☉ pla		Year 1765 1773 ☉ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♎		South		♎		South		♎		South		♎		South	
1	A	Sun r. 6. 13.	08	45	03	28	08	28	03	23	08	14	03	16	08	00	03	10
2	B		09	44	03	52	09	28	03	46	09	13	03	39	08	59	03	34
3	C		10	43	04	15	10	27	04	09	10	12	04	03	09	58	03	57
4	D		11	42	04	38	11	26	04	32	11	12	04	26	10	57	04	20
5	E	Pole Star.	12	42	05	01	12	25	04	55	12	11	04	49	11	57	04	44
6	F		13	41	05	24	13	25	05	18	13	10	05	12	12	56	05	07
7	G		14	40	05	47	14	24	05	41	14	10	05	35	13	55	05	30
8	A	Southermost in Androme-	15	40	06	10	15	23	06	04	15	09	05	58	14	55	05	53
9	B	da's Girdle.	16	39	06	33	16	23	06	27	16	08	06	21	15	54	06	16
10	C	Sun r. 6. 29.	17	39	06	56	17	22	06	49	17	08	06	44	16	53	06	39
11	D		18	38	07	19	18	22	07	12	18	07	07	07	17	53	07	02
12	E	Sun r. 6. 35.	19	37	07	42	19	21	07	35	19	07	07	30	18	52	07	25
13	F		20	37	08	04	20	21	07	58	20	06	07	53	19	52	07	48
14	G		21	37	08	26	21	20	08	20	21	06	08	15	20	52	08	10
15	A		22	36	08	48	22	20	08	42	22	06	08	37	21	51	08	32
16	B		23	36	09	10	23	20	09	04	23	05	08	59	22	51	08	54
17	C		24	36	09	32	24	19	09	26	24	05	09	21	23	50	09	16
18	D	Luke Evan.	25	35	09	54	25	19	09	48	25	05	09	43	24	50	09	38
19	E		26	35	10	16	26	19	10	10	26	04	10	05	25	50	10	00
20	F		27	35	10	38	27	19	10	32	27	04	10	27	26	50	10	22
21	G	Sun r. 6. 52.	28	35	10	59	28	19	10	54	28	04	10	48	27	50	10	43
22	A	Andromeda's	29	35	11	20	29	18	11	15	29	04	11	09	28	49	11	04
23	B	Southermost	♏	35	11	41	♏	18	11	36	♏	04	11	30	29	49	11	25
24	C	Foot.	01	35	12	02	01	18	11	57	01	04	11	51	♏	49	11	46
		Sol in Scorpio																
25	D	Sun r. 7. 4.	02	35	12	23	02	18	12	18	02	04	12	12	01	49	12	07
26	E		03	35	12	44	03	18	12	38	03	04	12	33	02	49	12	28
27	F		04	35	13	04	04	18	12	59	04	04	12	53	03	49	12	49
28	G	Simon & Jude	05	35	13	24	05	18	13	19	05	04	13	13	04	49	13	09
29	A		06	35	13	44	06	18	13	39	06	04	13	33	05	49	13	29
30	B	Sun r. 7. 10.	07	35	14	04	07	18	13	58	07	04	13	53	06	49	13	49
31	C		08	35	14	23	08	18	14	17	08	04	14	13	07	49	14	08

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap Year 1760 1768 ☉ pla	1764 1772 ☉ dec	First Year 1761 1769 ☉ pla	1765 1773 ☉ dec	Second Year 1762 1770 ☉ pla	1766 1774 ☉ dec	Third Year 1763 1771 ☉ pla	1767 1775 ☉ dec
			D M ♏	D M South	D M ♏	D M South	D M ♏	D M South	D M ♏	D M South
1		All Saints	09 35	14 42	09 19	14 37	09 04	14 32	08 50	14 27
2		Sun r. 2. 14	10 35	15 01	10 19	14 56	10 04	14 51	09 50	14 47
3			11 36	15 20	11 19	15 15	11 05	15 10	10 50	15 06
4		K. Will. Nat.	12 36	15 39	12 19	15 34	12 05	15 29	11 50	15 25
5		Powder Plot	13 36	15 57	13 20	15 52	13 05	15 47	12 51	15 43
6			14 37	16 15	14 20	16 10	14 05	16 05	13 51	16 01
7			15 37	16 33	15 20	16 28	15 06	16 23	14 51	16 19
8			16 37	16 50	16 21	16 45	16 06	16 41	15 52	16 37
9			17 38	17 07	17 21	17 02	17 07	16 58	16 52	16 54
10		Sun r. 7. 29.	18 38	17 24	18 22	17 19	18 07	17 15	17 52	17 11
11		Martin B.	19 39	17 40	19 22	17 36	19 07	17 32	18 53	17 28
12			20 39	17 56	20 23	17 52	20 08	17 48	19 53	17 44
13		Sun r. 7. 34.	21 40	18 12	21 23	18 08	21 08	18 04	20 54	18 00
14			22 40	18 28	22 24	18 24	22 09	18 20	21 54	18 16
15			23 41	18 43	23 24	18 39	23 10	18 35	22 55	18 32
16			24 41	18 58	24 25	18 54	24 10	18 50	23 55	18 47
17			25 42	19 13	25 25	19 09	25 11	19 05	24 56	19 02
18			26 43	19 27	26 25	19 24	26 11	19 20	25 57	19 16
19			27 43	19 41	27 26	19 38	27 12	19 34	26 57	19 30
20			28 44	19 54	28 27	19 51	28 13	19 48	27 58	19 44
21			29 45	20 07	29 28	20 04	29 14	20 01	28 59	19 58
22		Sol in Sagit.	♐ 46	20 20	♐ 29	20 17	♐ 14	20 14	29 59	20 11
23			01 46	20 32	01 30	20 30	01 15	20 27	01 ♐ 00	20 24
24		Sun r. 7. 47.	02 47	20 44	02 30	20 42	02 16	20 39	02 01	20 36
25			03 48	20 56	03 31	20 54	03 17	20 51	03 02	20 48
26			04 49	21 08	04 32	21 05	04 17	21 02	04 03	20 59
27			05 50	21 19	05 33	21 16	05 18	21 13	05 03	21 10
28			06 51	21 30	06 34	21 26	06 19	21 24	06 04	21 21
29		Aldebaran.	07 51	21 40	07 35	21 36	07 20	21 34	07 05	21 31
30		Andrew Ap.	08 52	21 49	08 36	21 46	08 21	21 44	08 06	21 41

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Leap 1760 1768 ☉ pla		Year 1764 1772 ☉ dec		First 1761 1769 ☉ pla		Year 1765 1773 ☉ dec		Second 1762 1770 ☉ pla		Year 1766 1774 ☉ dec		Third 1763 1771 ☉ pla		Year 1767 1775 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♐		South		♐		South		♐		South		♐		South	
1		Sun r. 7. 58.	09	53	21	58	09	37	21	55	09	22	21	53	09	07	21	51
2			10	54	22	07	10	38	22	04	10	23	22	02	10	08	22	00
3			11	55	22	15	11	38	22	13	11	24	22	11	11	09	22	09
4			12	56	22	23	12	39	22	21	12	25	22	19	12	10	22	17
5			13	57	22	31	13	40	22	29	13	26	22	27	13	11	22	25
6			14	58	22	38	14	41	22	36	14	27	22	34	14	12	22	32
7			15	59	22	45	15	42	22	43	15	28	22	41	15	13	22	39
8			17	00	22	51	16	43	22	49	16	29	22	47	16	14	22	46
9			18	01	22	56	17	44	22	55	17	30	22	53	17	15	22	52
10			19	02	23	01	18	45	23	00	18	31	22	59	18	16	22	58
11		Sun r. 8. 5.	20	03	23	06	19	47	23	05	19	32	23	04	19	17	23	03
12		First in Orion's Belt.	21	04	23	10	20	48	23	10	20	33	23	09	20	18	23	08
13			22	05	23	14	21	49	23	14	21	34	23	13	21	19	23	12
14		Laſt in Orion's Belt.	23	07	23	18	22	50	23	17	22	35	23	16	22	20	23	16
15			24	08	23	21	23	51	23	20	23	36	23	19	23	21	23	19
16			25	09	23	23	24	52	23	23	24	37	23	22	24	23	23	22
17		Orion's right	26	10	23	25	25	53	23	25	25	38	23	24	25	24	23	24
18		ſhoulder and	27	11	23	27	26	54	23	27	26	39	23	26	26	25	23	26
19		Auriga's right	28	12	23	28	27	55	23	28	27	41	23	27	27	26	23	28
20		ſhoulder.	29	13	23	29	28	57	23	29	28	42	23	28	28	27	23	29
21		Sun r. 8. 9. Thomas Ap.	♑	15	23	29	29	58	23	29	29	43	23	29	29	28	23	29
22		Sol in Capri.	01	16	23	29	♑	59	23	29	♑	44	23	29	♑	29	23	29
23			02	17	23	28	02	00	23	28	01	45	23	28	01	31	23	28
24		Foot of g. Dog	03	18	23	26	03	01	23	27	02	47	23	27	02	32	23	27
25		Nat. of Chriſt	04	19	23	24	04	02	23	25	03	48	23	25	03	33	23	26
26		St. Stephen	05	20	23	22	05	04	23	23	04	49	23	23	04	34	23	24
27		St. John Evan	06	22	23	20	06	05	23	20	05	50	23	21	05	35	23	22
28		Innocents.	07	23	23	17	07	06	23	17	06	51	23	18	06	36	23	19
29		Mouth of the	08	24	23	13	08	07	23	14	07	52	23	14	07	38	23	16
30		great Dog or	09	25	23	09	09	08	23	10	08	54	23	10	08	39	23	12
31		Syrius.	10	26	23	04	10	10	23	06	09	55	23	06	09	40	23	08

A TABLE of the Variation of the Sun's Declination to every 15 Degrees of Longitude, from the Meridian of *London*.

Degrees of Longitude from the Meridian of LONDON.

Daily Vari.	Deg. 15	Deg. 30	Deg. 45	Deg 60	Deg. 75	Deg. 90	Deg. 105	Deg. 120	Deg. 135	Deg. 150	Deg. 165	Deg. 180
Min	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	02	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	03	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	02	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is 11 Columns, the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters, A, B, C, &c. the third the Southing of ſeveral Stars at Midnight, at which Time the ſaid Stars may (in the Abſence of the Moon, and Weather permitting) be obſerved, thereby to find the Latitude; in the ſame Column is given the Time of Sun-riſing, (and by ſubtracting the Time of riſing from 12 Hours, gives the Time of ſetting) the eight following Columns ſhew the Sun's Place and Declination for Leap-Year, Firſt, Second, and Third, according to their reſpective Titles.

For the more ready knowing of Leap-Year, the following Table is inſerted, where it is found by Inſpection, and then follow the Firſt, Second, and Third Years after Leap-Year.

Leap-Year.	Firſt Year.	Second Year.	Third Year.
1760	1761	1762	1763
1764	1765	1766	1767
1768	1769	1770	1771
1772	1773	1774	1775
1776	1777	1778	1779
1780	1781	1782	1783
1784	1785	1786	1787
1788	1789	1790	1791

The Uſe of the CALENDAR.

To find the Day of the Week or Month for any Time paſt, or to come, by the Calendar.

Firſt, Find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppoſe it is required to find what Day of the Month will be the third *Wedneſday* in *March*, 1763.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be B, turn to the Month of *March*, and account B for *Sunday*, then the Letter E is for *Wedneſday*, and the Third *Wedneſday* is the 16th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1772.

This Year being Leap-Year has two Dominical Letters, E and D; the firſt Letter, to wit E, ſerving from the firſt of *January* to the End of *February*; the laſt Letter, to wit D, ſerves from thence to the Years End.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Wedneſday*, the Day of the Week required.

To find the Sun's Place and Declination by the Calendar.

Example 1. Suppose the Sun's Place and Declination be required on the 10th of *January*, 1764, being Leap-Year.

In the Month of *January* in the first Column look the Day of the Month, over against which, under Leap-Year stands 19.52, that is, the Sun's Place is in 19 deg. 52 min. of *Capricornus :* In the next Column under the said Year stands 22.01, under the Title South, which shews the Declination to be 22 deg. 01 min. Southerly ; and this also will practically serve for the Year 1768, for the said 10th of *January*, being Leap-Year.

Example 2. Suppose the Sun's Place and Declination is required on the 10th of *March*, 1766, being the second after Leap-Year.

In the Month of *March*, in the first Column find the Day of the Month, over-against which, under Second Year, stands 19.57 which shews the Sun's Place to be in 19 deg. 57 min. of *Pisces* ; and in the next Column under Second Year, stands 03.59, which shews the Declination to be 03d. 59m. Southerly, which was required.

Although it is common to take the Declination as it is in the Calendar, yet if the Difference of Longitude be considerable from *London*, it is requisite the Declination should be corrected, because in the Calendar it is calculated for the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Calendar, is added ; the Use and Explanation whereof follows.

I N the first Column of this Table is the daily Variation, which is found by subtracting the Declination of the given Day of the Month found in the Calendar, from the Declination for the Day following : or contrarily this from that, that is, the lesser from the greater, and the Difference is the daily Variation : In the Head of the other Columns are Degrees of Longitude from *London*, either Easterly or Westerly, and in those Columns under the respective deg. of Longitude, are the Minutes of the Declination, answerable to the daily Variation : As suppose the daily Variation was 10 min. and the Difference of Longitude 90 deg. against 10 in the first Column, and under 90 deg. at the Head of the Table, stands 2 Minutes answering thereunto, and are to be used as follows.

The Use of the Table of the Variation of the Sun's Declination.

The Rule. First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Calendar ; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted ; but the Declination decreasing, it must be added.

Example 1. *April* the 19th, 1764, being at Sea, the Difference of Longitude from the Meridian of *London*, 90 degrees Westerly, I find the

Decli-

Declination in the Calendar to be 11 deg. 27 min. North; and the 20th Day, the Declination is 11 deg. 47 min. therefore subtracting the lesser Declination from the greater, the Remainder is 20 min. which is the daily Increase; Then in the Table under 90 deg. and over against 20, stands 5 min. (which because the Difference of Longitude is Westerly, and the Declination increasing) must be added to 11 deg. 27 min. before found which makes the true Declination 11 deg. 32 min. North.

If the Difference of Longitude in this Case had been Easterly, the 5 min. found in the Table must have been subtracted.

Note, It is easily discerned, whether the Declination increase or decrease, by observing whether the Declination for the Day following be greater or lesser: For if it be greater, then it increases; but if less, then it decreases.

Example 2. *January* the 25th, 1763, being at Sea, the Difference of Longitude from *London,* 120 deg. Westerly: I find the Declination in the Calendar to be 18 deg. 58 min. South, and the 26th Day it is 18 deg. 43 min. therefore subtracting the lesser from the greater, the Difference is 15 min. which is the daily decrease; then in this Table under 120 deg. and against 15 stands 5 min. (which because the Difference of Longitude is Westerly, and the Declination decreasing) must be subtracted, which makes the true Declination 18 deg. 53 min. South: If the Difference of Longitude had been Easterly, the 5 min. must have been added.

The Use of the Sun's Declination to find the Latitude.

The Knowledge of the Sun's Declination at any Time, and in any Longitude, is of great Importance at Sea, for by this, and the Complement of the Sun's Meridian Altitude (commonly called the Zenith Distance) taken with a Quadrant or Cross-staff, is found the Latitude of the Place the Ship is then in; to perform which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude, North.

Example. Suppose at Sea, the 10th of *April,* 1764, the Declination found by the Table is 8 deg. 14 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Observation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is — 23 10 South
Declination of the Sun is — — — 08 14 North

The Latitude of the Place is — — 31 24 North

Rule 2. If the Sun comes to the Meridian in the North, and hath North Declination, then subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude, North: But if the Complement of the Altitude exceed the Declination, subtract the Declination therefrom, and the Remainder is the Latitude, South.

Example 1. Suppose at Sea, *May* 20, 1764, the Declination being 20 deg. 09 min. North, the Sun comes to the Meridian in the North, and by observing with a Quadrant the Sun's Zenith Distance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's

Sun's Declination is ———————————— 20d. : 09m. North
The Sun's Zenith Distance ———————— 18d. : 42m. North
The Latitude is ——————————————— 1d. : 27m. North

Example 2.   At Sea, *June* 10th, 1761, the Sun's Declination by the Table is 23 deg. 5 min. North, the Complement of the Meridian Altitude, by Observation is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude is——— 33d. : 10m. North
Sun's Declination ————————————— 23d. : 05m. North
The Latitude is ———————————————— 10d. : 05m. North

Rule 3.   If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude, South.

Example 3.   At Sea, *January* 29th, 1764, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22d. 10 min.   What is the Latitude?

Complement of the Sun's Meridian Altitude is——— 22d. : 10m. North
Sun's Declination is ————————————— 17d. : 59m. South
The Latitude is ———————————————— 40d. : 09m. South

Rule 4.   If the Sun comes to the Meridian in the South, and hath South Declination, subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South : But if the Complement of the Meridian Altitude exceeds the Declination, subtract the Declination therefrom, the Remainder is the Latitude, North.

Example 1.   At Sea, *January* 1st, 1764, the Sun cometh to the Meridian in the South : The Complement of the Altitude is 10 deg. 36 min.   What is the Latitude?

Sun's Declination ————————————— 23d. : 03m. South
Complement of Meridian Altitude ————— 10d. : 36m. South
Latitude of the Place ———————————— 12d. : 27m. South

Example 2.   At Sea, *February* 18th, 1762, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min.   What is the Latitude?

Complement of the Sun's Meridian Altitude ——— 25d. : 20m. South
Sun's Declination —————————————— 11d. : 31m. South
Latitude —————————————————— 13d. : 49m. North

Rule 5.   If the Star be in the Zenith (that is, right over Head) and has either North or South Declination, that Declination is the Latitude either North or South agreeable to the Name.

Rule 6.   If the Sun hath no Declination, the Complement of the Meridian Altitude, is the Latitude, and is North or South, according as the Ship is to the Northward or Southward of the Sun.

A

Days	Jan. ⊙ Right Ascen.		Feb. ⊙ Right Ascen.		March ⊙ Right Ascen.		April ⊙ Right Ascen.		May ⊙ Right Ascen.		June ⊙ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	18	49	21	01	22	50	00	43	02	34	04	37
2	18	53	21	05	22	54	00	47	02	38	04	41
3	18	58	21	09	22	57	00	50	02	42	04	45
4	19	02	21	13	23	01	00	54	02	46	04	49
5	19	06	21	17	23	05	00	58	02	50	04	53
6	19	11	21	21	23	08	01	01	02	53	04	57
7	19	15	21	25	23	12	01	05	02	57	05	01
8	19	19	21	29	23	16	01	09	03	01	05	06
9	19	24	21	33	23	19	01	12	03	05	05	10
10	19	28	21	37	23	23	01	16	03	09	05	14
11	19	32	21	41	23	27	01	20	03	13	05	18
12	19	37	21	44	23	31	01	24	03	17	05	22
13	19	41	21	49	23	34	01	27	03	21	05	26
14	19	45	21	53	23	38	01	31	03	25	05	31
15	19	50	21	56	23	41	01	34	03	29	05	35
16	19	54	22	00	23	45	01	38	03	33	05	39
17	19	58	22	04	23	49	01	42	03	37	05	43
18	20	02	22	08	23	53	01	45	03	40	05	47
19	20	07	22	12	23	56	01	49	03	44	05	51
20	20	11	22	16	24	00	01	53	03	48	05	56
21	20	15	22	20	00	03	01	57	03	53	06	00
22	20	19	22	23	00	07	02	00	03	56	06	04
23	20	24	22	27	00	11	02	04	04	00	06	08
24	20	28	22	31	00	14	02	08	04	05	06	12
25	20	32	22	35	00	18	02	12	04	09	06	16
26	20	36	22	39	00	21	02	15	04	13	06	20
27	20	40	22	42	00	25	02	19	04	17	06	25
28	20	44	22	46	00	29	02	23	04	21	06	29
29	20	49			00	32	02	27	04	25	06	33
30	20	53			00	36	02	30	04	29	06	37
31	20	57			00	40			04	33		

H

Days	July ☉ Right Ascen.		August ☉ Right Ascen.		Septem. ☉ Right Ascen.		October ☉ Right Ascen.		Novem. ☉ Right Ascen.		Decemb. ☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	06	41	08	46	10	42	12	30	14	27	16	31
2	06	45	08	50	10	46	12	34	14	31	16	35
3	06	49	08	54	10	49	12	38	14	35	16	39
4	06	54	08	57	10	53	12	41	14	39	16	44
5	06	58	09	01	10	57	12	45	14	43	16	48
6	07	02	09	05	11	00	12	49	14	46	16	52
7	07	06	09	09	11	04	12	52	14	50	16	57
8	07	10	09	13	11	07	12	56	14	54	17	01
9	07	14	09	17	11	11	13	00	14	58	17	06
10	07	18	09	21	11	15	13	03	15	03	17	10
11	07	22	09	24	11	18	13	07	15	07	17	13
12	07	26	09	31	11	22	13	11	15	11	17	18
13	07	30	09	32	11	25	13	14	15	15	17	22
14	07	35	09	36	11	29	13	18	15	19	17	27
15	07	39	09	39	11	33	13	22	15	23	17	32
16	07	43	09	43	11	36	13	25	15	27	17	36
17	07	47	09	47	11	40	13	29	15	31	17	41
18	07	51	09	51	11	43	13	33	15	35	17	45
19	07	55	09	54	11	47	13	37	15	40	17	50
20	07	59	09	58	11	51	13	41	15	44	17	54
21	08	03	10	02	11	54	13	44	15	48	17	59
22	08	07	10	06	11	58	13	48	15	52	18	03
23	08	11	10	09	12	01	13	52	15	56	18	08
24	08	15	10	13	12	05	13	56	16	01	18	12
25	08	19	10	17	12	09	14	00	16	05	18	17
26	08	23	10	20	12	12	14	03	16	09	18	21
27	08	27	10	24	12	16	14	07	16	13	18	25
28	08	30	10	28	12	19	14	11	16	18	18	30
29	08	34	10	31	12	23	14	15	16	22	18	34
30	08	38	10	35	12	27	14	19	16	26	18	39
31	08	42	10	39			14	23			18	43

A TABLE shewing the Right Ascension, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit.	Right Ascen. h. m.		Declination d. m.		
END of Pegasus's Wing, Algenib ———	2	00	01	13	50	N
Pole Star ———————————	2	00	44	88	00	N
Girdle of Andromeda ———————	2	00	56	34	19	N
Bright Star in Aries ———————	2	01	53	22	18	N
Medusa's Head, Algol ———————	2	02	52	40	00	N
Bright side of Perseus———————	2	03	07	48	58	N
Aldebaran, or Bull's Eye —————	1	04	22	16	00	N
Capella, or the Goat ———————	1	04	59	45	43	N
Bright Foot of Orion, Rigel ———	1	05	02	08	30	S
Middle Star in Orion's Belt———	3	05	23	01	23	S
Orion's Right Shoulder —————	1	05	41	07	20	N
Auriga's Right Shoulder —————	2	05	40	44	54	N
Bright Foot of Gemini —————	2	06	23	16	35	N
Syrius, or the Great Dog ———	1	06	34	16	23	S
Castor, or Northermost Twin ———	2	07	18	32	24	N
Procyon, or the Little Dog ———	2	07	26	05	51	N
Pollux, or Southermost Twin ———	2	07	29	28	36	N
Hydra's Heart———————————	1	09	14	07	36	S
Lyon's Heart, or Regulus ———	1	09	54	13	10	N
The Lower of the Pointers ———	2	10	45	57	42	N
The Upper of the Pointers ———	2	10	47	63	03	N
Lyon's Tail, Deneb ———————	1	11	35	15	56	N
Upper of the two last in □ of the Great Bear	2	12	01	58	23	N
Last but two in the Great Bear's Tail———	2	12	41	57	18	N
Virgin's Spike ———————————	1	13	10	09	53	S
Last but one in the Great Bear's Tail ———	2	13	12	56	13	N
Last in the Great Bear's Tail ———	2	13	35	50	33	N
Arcturus ———————————————	1	14	02	20	28	N
South Ballance ———————————	2	14	35	15	01	S
Foremost Guard ———————————	2	14	49	75	10	N
Brightest of the Crown —————	2	15	22	27	34	N
Brightest in the Serpent's Neck ———	2	15	30	07	13	N
Antares, the Scorpion's Heart ———	1	16	12	25	52	S
Head of Hercules———————————	3	17	01	14	42	N
Ophinous, or Serpent's Head———	3	17	21	12	46	N
Lyræ, or the Harp ———————	1	18	26	38	34	N
Swan's Bill ———————————————	3	19	19	27	29	N
Vulture, or Eagle's Heart ———	2	19	36	08	14	N

H 2

Swan's Tail ————————————	2	20	30	44	25	N
Mouth of Pegasus ———————	3	21	29	8	45	N
Fomelhaut ————————————	1	22	41	30	54	S
Marchab, or Pegasus's Wing ———	2	22	49	13	53	N
Scheat, or Pegasus's Leg ————	2	22	48	26	45	N
Cepheus's Knee ————————	3	23	20	76	7	N
Andromeda's Head ——————	2	23	52	27	43	N

The Explanation *and Use of the* Table *of the* Sun's Right-Ascension, *and of the* Table *of the* Star's Right Ascension *and* Declination.

IN the Table of the Sun's Right Ascension, the first Page contains the first six Months of the Year; the next Page the other six Months; at the Head of the Table are the Months; in the first Column towards the Left-hand are the Days of the Month, and in the opposite Column is the Right Ascension in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the first towards the Left-hand, are the Names of the Stars; in the second, the Star's Magnitude; in the third, the Right Ascension in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

First, To find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 Hours, and then subtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the Time that *Fomelhaut* comes upon the Meridian on the 21st of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 41 min. and the Sun's to be 13 Hours 44 min. which subtracted from the Star's Right Ascension, leaves 8 Hours 57 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 26th of *October* was required.

I find the Star's Right Ascension to be 4 Hours 22 min. the Sun's 14 Hours 3 min. Now because the Sun's Right Ascension is more than the Stars, add to the Star's Right Ascension 24 Hours, which makes 28 Hours 22 min. from which subtracting the Sun's Right Ascension 14 Hours 3 min. there remains 14 Hours 19 min. from which subtracting 12 Hours, there remains 2 Hours 19 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the same Time?

The

The Rule. To the Sun's Right Afcenfion, add the Time from Noon, at which the Star's coming to the Meridian is defired; the Sum is the Right Afcenfion of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Afcenfion and Declination, where look what Star's Right Afcenfion agrees with the Right Afcenfion before found, or neareft thereto, and that is the Star fought for.

Example. Suppofe *April* the 7th, I defire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Afcenfion is 1 Hour 5 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Afcenfion, makes 9 Hours 5 Minutes; the neareft in the Table is *Hydra's-Heart*, whofe Right Afcenfion is 9 Hours 14 Minutes, and therefore Souths at 8 Hours 9 Minutes nearly, and fo in others.

Directions for obferving the Stars, to find the Latitude of the Place.

Having before fhewn how to find the Time of the Star's coming to the Meridian, I fhall now fhew by the Stars Altitude how to find the Latitude.

Note, In North Latitude, thofe Stars whofe North Declination exceed the Complement of that Latitude may be obferved under the Pole, and the fame may be performed by the Southern Stars in South Latitude.

Particular Directions for finding the Latitude, by the Meridian Altitude of the fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Meridian Altitude or Zenith Diftance, (by Obfervation) added to the Declination of the Star, found in the Table of the Star's Right Afcenfion and Declination, gives the Latitude North.

Example. On the 21ft of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's-Heart* comes to the Meridian in the South, at 1 Hour 39 min. after Midnight; the Meridian Altitude by Obfervation was 63 Degrees; which fubtracted from 90 deg. there remains 27 deg. the Complement of the Altitude; to which adding 13 deg. 10 min. the Declination of the Star North, gives 40 deg. 10 min. the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, fubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North: But if the Declination exceed the Complement of the Altitude, fubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppofe on the 21ft of *July*, being at Sea, the Star *Fomelhaut* cometh to the Meridian in the South, at 2 Hours 38 min. after Midnight, the Merid. Alt. 35 deg. 50 min. the Comp. whereof is 54 deg. 10 min. the Star's Declination is 30 deg. 54 min. South, which fubtracted from the Complement of the Alt. leaves 23d. 16m. which is the Latitude North.

Example

Example 2. Suppoſe on the firſt of *July*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 31 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 deg. 52 min. South, from which ſubtracting the Complement of the Altitude, there remains 20 deg. 25 min. which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, ſubtract the Declination from the Complement of the Altitude, the Remainder is the Latitude South: But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 22d of *June* the *brigheſt in the Harp* comes to the Meridian in the North at 22 min. after Midnight, the Complement of the Altitude is 79 deg. from which ſubtracting the Declination, which is 38 deg. 34 min. North, there remains 40 deg. 26 min. which is the Latitude South.

Example 2. On the 22d of *September*, *Andromeda's-Head* comes to the Meridian in the North at 11 hours 54 minutes at Night, the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 43 min. gives 20 deg. 33 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 23d of *December*, (*Syrius or the great Dog's Mouth*) comes to the Meridian in the North at 26 Minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 23 min. the Declination South, gives 46 deg. 23 min. the Latitude South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Stars Declination.

Example. On the 21ſt of *March*, the Pole Star comes to the Meridian under the Pole at 41 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 0 min. which added together, gives 46 deg. 30 min. which is the Latitude, North.

Rule 6. If a Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star has no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward of the Obſerver.

The Deſcription and Uſe of the Sea-Quadrant.

THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in Obſerving, reſpects the Horizon, as at A ; the Shade Vane, ſo called becauſe of its giving the Shadow upon the Horizon Vane, in Time of obſervation, as at B ; beſides this Shade Vane, there is another now in Uſe, having a Convex Glaſs properly fixed therein, which throws a lucid Point upon the Line of Direction in the Horizon Vane, and

is of great Service in gloomy Weather, when the Rays of the Sun are too weak to produce a diftinct Shadow, by the former ; (But the only Inftrument for this purpofe, and far fuperior to any other now in Practice, is HADLEY'S Quadrant ;) Laftly, the Sight Vane, which in Time of Obfervation is placed at the Eye, through which the Shadow (or lucid Point) and Horizon are feen, as at C.   The leffer of the Arches mark'd with *d e,* is called the Sixty Arch, becaufe it contains 60 (or more commonly of late 65) Degrees : In Time of Obfervation the Shade Vane is placed upon this Arch always to an even Degree ; it is numbered from the upper end at *e,* downwards to *d,* with 5, 10, 15, 20, &c.   The bigger Arch marked with *g* F, is called the Thirty-Arch, becaufe it contains 30 (or rather 25) Degrees, and is divided into Degrees and Minutes.
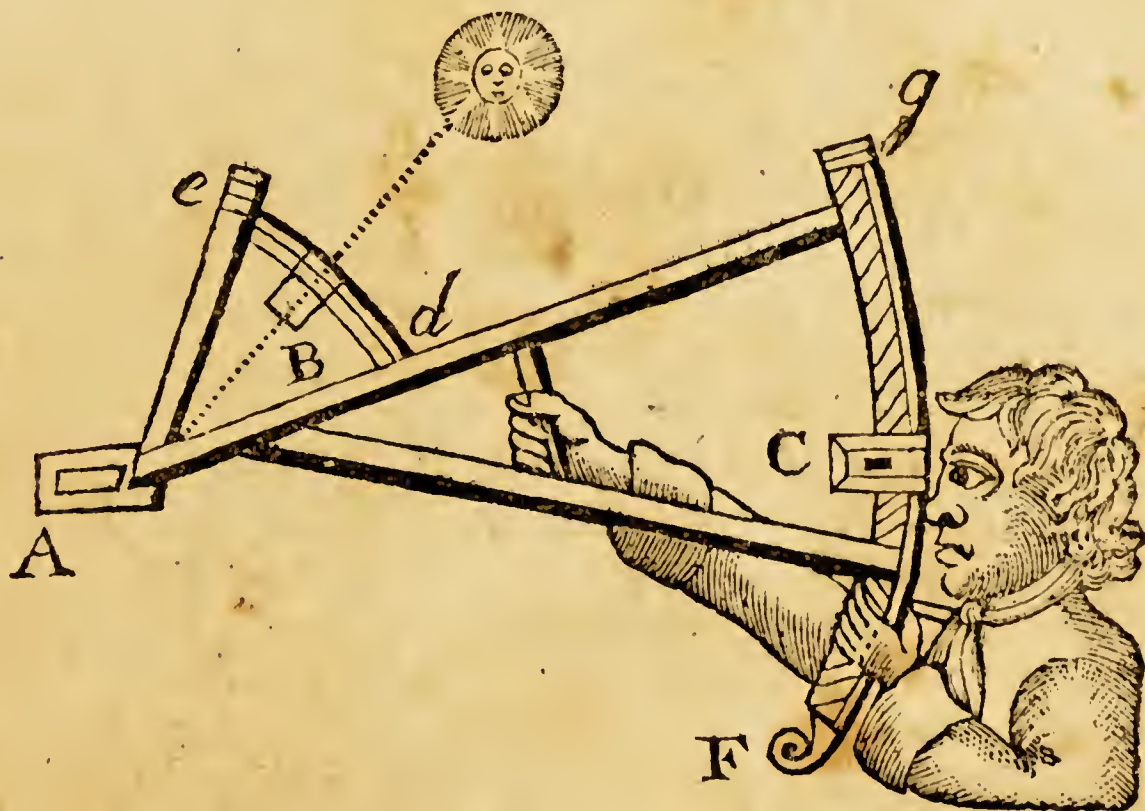
The Ufe of this Inftrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or leffer Arch) to a Number of Degrees, lefs than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty Arch : The Vanes being thus fixed upon the Quadrant, your Back being turned to the Sun, and the Sight Vane placed to the Eye, look thro' the faid Sight Vane, and caufe the Shadow of the upper Edge of the Shade Vane (or lucid Point in the Glafs Vane) to fall upon the upper Part of the Slit in the Horizon Vane, where ufually (for Perfpicuity Sake) there is drawn a black Line or Line of Direction ; and if at the fame Time the Horizon appear tho' the faid Slit in the Horizon Vane, you have then the Sun's prefent Altitude, or Zenith Diftance ; but if the Sea appear inftead of the Horizon, then flide the Sight Vane lower towards F ; if the Sky appear inftead of the Horizon, then flide the Sight Vane a little higher until the Horizon appear thro' the Horizon Vane : But to obtain the Meridian

Altitude, (which is the greateft Altitude the Sun will have that Day, and is the Thing ufed to find the Latitude,) continue obferving, and as the Sun rifes, the Sea will appear through the Horizon Vane ; then muft the Sight Vane be removed lower ; And thus continue obferving, as often as may be convenient till the Sun be at the higheft, which is the Meridian Altitude : When the Sun begins to fall, the Sky will appear inftead of the Horizon, and then it's Time to give over obferving for that Day : Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude ; the Ufe of which for finding the Latitude, is fufficiently fhewed in the preceding Rules.
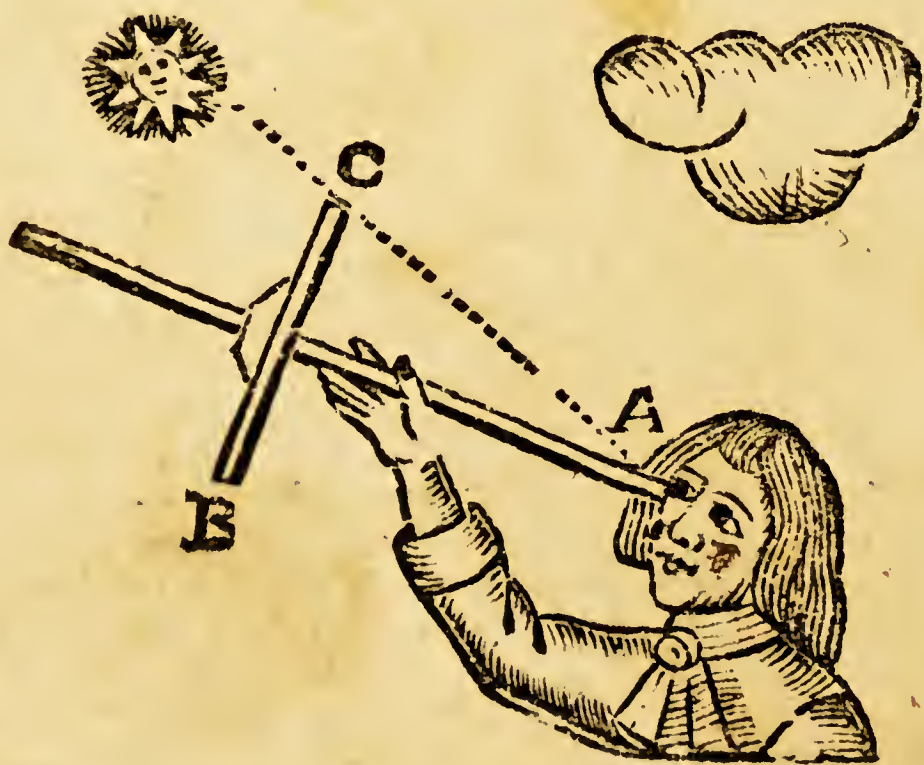
Defcription and Ufe of the Crofs-ftaff, *or* Fore ftaff.

THIS Inftrument confifts of a Staff and four Croffes, the firft and fhorteft is called the Ten Crofs, and belongs to that Side of the Staff which is numbered from about 3 Degrees to 10 Degrees ; Sometimes the Thirty Crofs, and the reft of the Croffes are fo made, as that the Breadth of any of them may ferve inftead of this Ten-Crofs.

The fecond Crofs is called the Thirty-Crofs, and belongs to that Side of the Staff which is numbered from about 10 Degrees to 30.

The Third Crofs is called the Sixty-Crofs, and belongs to that Side of the Staff which is numbered from about 20 to 60 Degrees.

The Fourth and laft Crofs is called the Ninety-Crofs, and belongs to that Side of the Staff, which is numbered from about 30 to 90 Degrees.

This Staff is likewife numbered with the Complement to 90 Degrees, (*viz.*) at 10 ftands 80, at 20 ftands 70, at 30 ftands 60 ; and fo of the reft.

The Ufe of this Inftrument is to take the Meridian Altitude of the Sun or Star, which is performed as followeth.   Firft,

First, Confider how great the Sun's Meridian Altitude will be that Day; and accordingly ufe the Crofs moft fuitable, *(viz.)* if the Meridian Altitude be judged to be under 10 deg. ufe the Ten Crofs; if between 10 and 30, the Thirty Crofs; if between 30 and 60, the Sixty Crofs; if between 60 and 90, the Ninety Crofs, which is feldom ufed.

Having put on the Crofs, place the flat or fquare End of the Staff at A, to the Outfide of the Eye, as near as may be, without hindering the Sight; thus the Face being towards the Sun or Star, hold the Crofs upright; then look at the upper End of the Crofs, at C, for the Sun or Star, and at the lower End at B, for the Horizon, and if the Sea appear inftead of the Horizon, remove the Crofs a little further from the Eye; but if the Sky appear inftead of the Horizon, remove the Crofs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Crofs then in Ufe, will be found the deg. and min. of Altitude of the Sun or Star. But the greateft Altitude being that which is required, Obfervation muft be continued as frequently as Judgment fhall direct, until the Sun or Star be at the higheft; and as the Sun or Star rifes, the Sky will appear inftead of the Horizon; but when the Sun or Star is paft the Meridian, and begins to fall, the Sea will appear inftead of the Horizon, and then is the Obfervation finifhed; and upon the Side of the Staff proper to the Crofs ufed, are found the Degrees and Minutes of the Sun's Meridian Altitude; which fubtracted from 90 deg gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbered with the Complement as fhewed before) with which to proceed in finding the Latitude of the Place, obferve the Rules and Directions foregoing.

The Defcription and Ufe of the Nocturnal.

I T confifts of three Parts, the firft an unmoveable Part, on which is the Handle, by which to hold it in Time of Obfervation, upon the forefide of which in the outermoft Circles are the Days of the Month, upon the innermoft are fet off the 24 Hours, and upon the Back fide are the 32 Points of the Compafs.

There are two forts of *Nocturnals*, the one made for the *Great-Bear*, the other for the *Little-Bear*. Thofe that are made for the *Great-Bear* have *February* at the Top, but thofe that are made for the *Little-Bear* have *April*, but now they are commonly made for both *Bears*, having two Indices.

The fecond, or middle Part contains two Circles, and the aforefaid Indices, one marked G, for the *Great-Bear*, and the other marked L, for the *Little-Bear*. The outermoft Circle is divided into 29 Days and an half, the Moon's Age; the innermoft into 24 Hours, the Index belonging to the *Bear*, you intended to obferve by, is to be fet to the Day of the Month at pleafure.

The third and upper Part is a long Index; the Edge of which (refpecting the Center) muft be turned to the Guards or Pointers, in Time of Obfervation.

Note, That by the Alteration of the Stile, the prefent Nocturnals are render'd erroneous, in fuch Examples as refer to the Days of the Month; but thefe Errors are eafily adjufted, by reckoning and fixing the Index of the Inftrument eleven Days backwards from the Day of Obfervation; in like Manner as is directed, and done in the Example following.

To find the Hour of the Night, and upon what Point of the Compafs the Guards are.

To do this, Firft, fet the Index of the middle Part to the Day of the Month, then hold the Inftrument upright, which may be difcerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Mid-

The Figure of the NOCTURNAL.
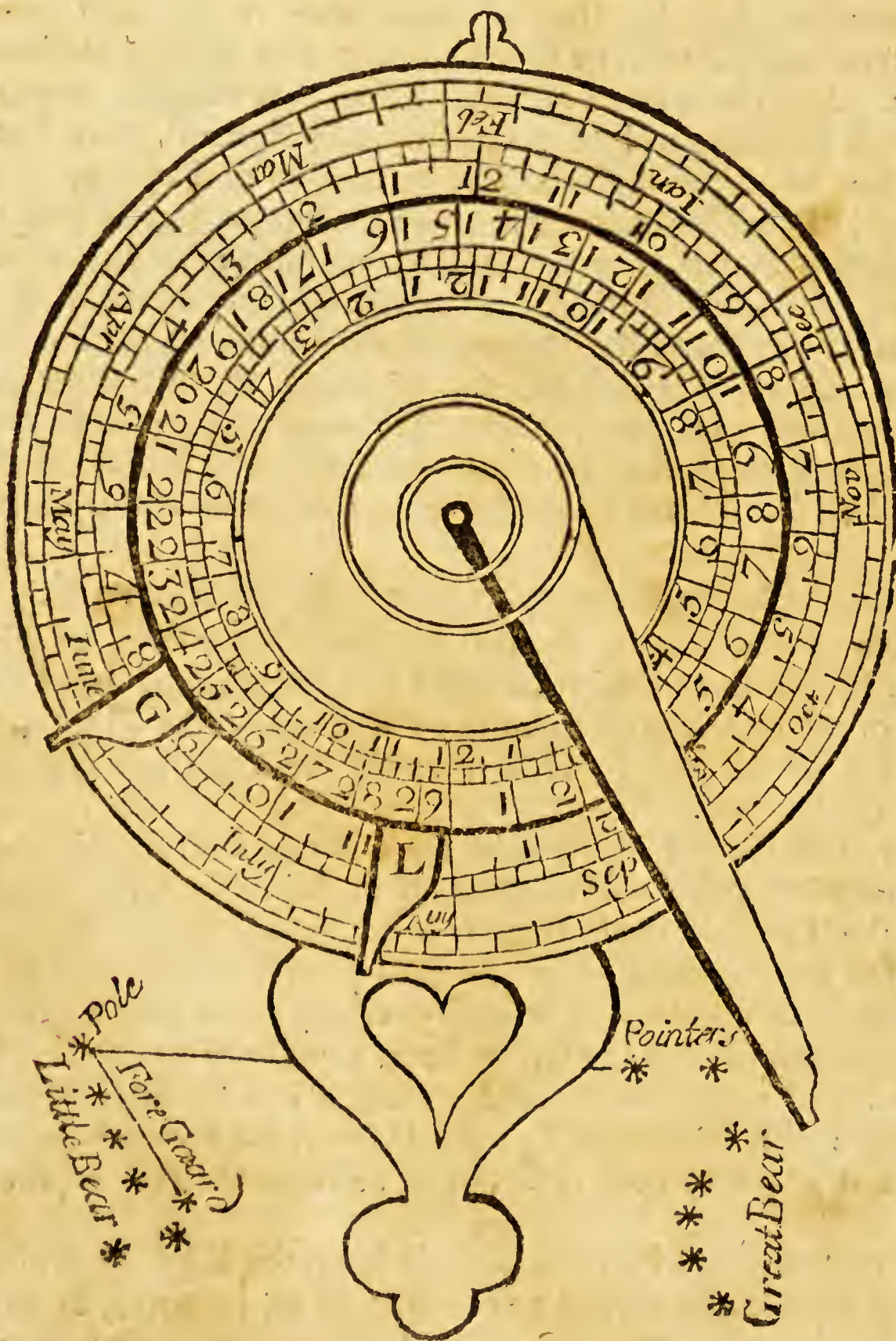
dle of the *Nocturnal*, for the North Star; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you obferve the *Little* or *Great Bear*, then fhall the Edge of the Index (upon the innermoft Circle of the middle Part) give the Hour of the Night.

Alfo in *Nocturnals* made for both Bears, you have on the Back-fide two Circles mark'd at the Bottom, the outermoft with *L*, and the innermoft with *G*; and numbered round with Degrees and Minutes, for finding how much the *Pole* Star is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed; obferve what Figures on the Back-fide fall under the Edge of the long Index, in the Circle belonging to the Bear by which you obferve, and that is the deg. and min. that the Star is above or under the Pole, as is diftinguifhed by the Words *Abo.* and *Und.*

Ex. To obferve by the *Gr. Bear, July* 6. *New-Stile*, which anfwers to *June* 25th, *Old-Stile*, reckoning eleven Days backwards, I fet the Index marked G to *June* 25, and looking through the Hole to the Pole, I turn the long Index, till it lie juft over the two Pointers, as you fee in the Figure of the *Noctur-nal*, and find on the innermoft Circle of the middle Part of the *Nocturnal*, that it is Two o'Clock in the Morning; and on the Back-fide in the Circle mark'd G, I find the Pole Star is 2 deg. 26 min. above the Pole, on the 6th of *July*, *New-Stile*, or according to the prefent eftablifhed Account: But the Bearings known, the Elevation or Depreffion of the North Star, above or below the Pole, is found by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outmoft Circle find the Moon's Age; and oppofite to it in the innermoft Circle of the fame Piece ftands the Southing.

Ex. Suppofe the Moon 25 Days old, and the Time of her Southing req.

Look for 25 the Moon's Age in the outermoft Circle, oppofite to which in the innermoft Circle ftands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change Days at any Place, and that gives the Time of Full Sea when required. But this has been fufficiently fhewed in another Place, and therefore needs no Example.

The Ufe of the following Table of the Declination of the North Star.

THE Ufe of the Table is this: Having taken the Alt. of the Pole Star, then obferve with the *Nocturnal* upon what Point of the Compafs the Guards are: oppofite to which in this Table ftands the Declination (fo called) which if the Star be below the Pole, is to be added to the Altitude, but if the Star be above the Pole, to be fubtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by thofe other Directions for the Stars before given, which is to be depended upon preferable to this laft Method, but folar Meridional Obfervations feperior to all.

A Table of the Declination of the North Star, *on every Point of the* Compass the Guards bear, *and for both Sorts of* Nocturnals.

	Points of the Compass.	For the Fore-Guard of the Little Bear.				For the Guards of the Great Bear, called the two Pointers.	
		D.	M.			D.	M
If the former of the Guards be ascending from the North or lower Part of the Meridian.	North	2	9	Above the Pole	If the two Pointers, or two Pointers be ascending from the North, or lower Part of the Meridian.	2	20	Above the Pole
	N by E	1	52			2	30
	N N E	1	29			2	35
	N E by N	1	2			2	33
	North East	0	35			2	26
	NE by E	0	6			2	13
	E N E	0	22			1	55
	East by North	0	52			1	33
	East	1	18			1	7
	East by South	1	41			0	38
	E S E	2	01			0	8
	S E by E	2	16	The North Star is under the Pole		0	22	The North Star is under the Pole.
	South East	2	25			0	52
	S E by S	2	30			1	20
	S S E	2	29			1	44
	South by East	2	22			2	4
If the Guards be descending from the South, or upper Part of the Merid.	South	2	11		If the after Wheel, or two Pointers be descending from the South or upper Part of the Merid.	2	20
	South by West	1	55			2	30
	S S W	1	34			2	29
	S W by S	1	10			2	27
	South West	0	43			2	23
	S W by W	0	14			2	13
	W S W	0	15	Above the Pole		1	55
	West by South	0	44			1	33
	West	1	11			1	07
	West by North	1	36			0	38
	W N W	1	58			0	8
	N W by W	2	14			0	22	Ab. the Pole
	North West	2	25			0	52
	NW by N	2	30			1	20
	N N W	2	29			1	44
	North by West	2	22			2	04

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Islands in the World; Corrected by the latest and best Observations; the Longitude reckoned from the Meridian of LONDON.

Note, *When the Latitude and Longitude of an Island is given, the middle of the Island is meant, except some particular Part of it is expressed.*

Places Names.	Latitude North.		Longit. E or W.		Places Names.	Latitude North		Longit. E. or W.	
The Coast of England.	D.	M.	D.	M.		D.	M.	D.	M.
Berwick	55	48	01	45 W	North Part of Lewis Island	58	20	07	20
Newcastle	55	12	01	30 W	St. Kilday	57	52	09	45
Stockton	54	33	01	25 W	Farro Head	58	34	05	10
Spurn	53	45	00	13 E	Northern Isles of Orkney	59	10	03	22
Yarmouth	52	40	01	38 E	Shetland S. Point	60	04	02	00
LONDON	51	31	00	00 E	Buchaness	57	45	01	18
North Foreland	51	25	01	24 E	Aberdeen	57	22	01	40
Beachy	50	46	00	25 E	Dundee	56	28	02	40
Dunnose Isle Wight	50	38	01	24	Edenburgh	55	58	02	59
Portland	50	30	02	44	The Coast of Ireland.				
Start Point	50	07	03	47					
LIZARD	49	57	05	14	Dublin	53	12	06	56
Land's-end	50	06	06	00	Wexford	52	13	07	27
St. Mary Scilly	50	00	06	46	Waterford	52	09	08	40
Hartland Point	51	06	04	35	Cork	51	49	09	30
Lundy Isle	51	20	04	40	Cape Clear	51	17	11	10
Bristol	51	33	04	35	Limrick	52	23	09	35
St. David's Head	51	00	05	22	Galway	53	07	09	40
Barsey or Bardsey Isle	52	44	05	00	Sline Head	53	20	11	15
Holy-head	53	24	04	50	Londonderry	55	00	07	50
Liverpool	53	20	03	00	Bellfast	54	39	06	30
Whitehaven	54	17	03	30	The Coast of Holland and Flanders.				
Carlisle	54	47	03	05					
The Coast of Scotland.					Scaw	57	30 N	10	20 E
Glascow	55	52 N	04	05 W	Helighland	54	24 N	08	35 E
N. Part of Sky Isle	57	45 N	05	45 W					Ham.

Places Names.	Latitude North D. M		Longit. E. or W. D. M	
Hambrough	53	41	10	35
Emden	53	05	07	35
The Fly	53	15	05	30
The Texel	53	15	05	10
Amsterdam	52	23	05	04
Rotterdam	51	55	04	30
The Brill	52	00	04	00
Sluys	51	14	03	43
Calais	50	58	01	54

(North Latitude — East Longitude)

The Coast of France and Portugal.

Places Names.	Lat.		Long.	
Dieppe	49	56	01	09 E
Cape de Hogue	49	47	02	00
Caskets	49	50	02	20
Guernsey	49	33	02	40
St. Maloes	48	39	01	57
Morlaix	48	33	03	49
Ushant	48	30	05	02
Brest	48	23	04	25
Penmark	47	48	04	24
Bell Isle	47	18	03	16
Nantz	47	14	01	39
Island Dieu	46	34	02	13
Island Ree	46	10	01	30
Rochel	46	10	01	11
Bourdeaux	44	50	00	38
Bilboa	43	29	02	58
Cape Ortegal	44	04	07	48
Cape Finister	43	12	09	40
Port a Port	41	10	09	25
Burlings	39	35	09	24
Rock of Lisbon	38	52	09	50
Lisbon	38	42	08	53
Cape St. Vincent	36	53	09	06
Cadiz	36	33	06	01
Cape Trefalgar	36	10	06	01

(North Latitude — West Longitude)

The Coast on the Main Continent within the Straits.

Places Names.	Lat.		Long.	
Gibraltar	36	12 N	04	53 W
Cape de Gat	36	40 N	01	40 W

Places Names.	Latitude North D. M.		Longit. E. or W. D. M.	
Cape Paul	38	13	00	05
Cape St. Martin	38	46	00	40
Barcelona	41	26	02	18
Marseilles	43	18	05	27
Toulon	43	07	06	02
Genoa	44	25	08	43
Leghorn	43	28	10	35
Rome	41	54	12	45
Naples	40	51	14	46
Cape Spartavento	37	55	16	55
Cape Collonne	38	56	18	05
Gallipoli	39	56	18	43
Cape St. Mary	39	45	19	00
Ancona	43	40	14	26
Venice	45	25	12	10
Lepanto	38	10	22	52
Cape Matapan	36	33	22	41
Cape St. Angelo	36	32	23	56
Athens	37	58	24	05
Cape Martelo S. P. of Negropont	38	07	25	03
Cape Monte Sancto	40	26	25	02
Salonica	40	41	23	13
Gallipoli	40	33	27	20
Constantinople	40	59	28	56
Smyrna	38	28	27	25
Ephesus	38	01	27	53
Antiochetta	36	30	32	46
Scandaroon	36	34	36	30
Aleppo	35	42	37	24
Tripoli	34	38	36	15
Alexandria	31	10	30	19
Cape Rusato	32	48	21	25
Cape Mesurato	32	21	16	17
Tripoly	32	54	13	10
Cape Bona	37	03	11	04
Bona	36	52	08	19
Algier	36	50	03	16
Cape de tres forcas	35	30	02	04 W
Tetuan	35	27	05	06 W
Ceuta	35	54	04	45 W
Tangier	35	42	05	22 W

(North Latitude — East Longitude)

Aboran

Places Names.	Latitude North. D. M.	Longit E. or W. D. M.	Places Names.	Latitude N. or S. D. M.	Longit. E. or W D. M.
Islands within the Straits.			Cape de Verde	14 43	17 20 W
			River Gambia	13 08	15 31
Alboran	35 54	02 29 W	Sierraleona	08 36	12 57
Formentura	38 33	01 55	Mezturado	06 05	10 02
Yvica	38 50	01 40	Cape Palmas	04 13	06 45
Majorca	39 30	03 03	Jaque Jaque	04 16	09 47
Minorca City	39 51	04 52	Assene	04 15	07 17
Port Mahon Minorca	39 42	04 12	Cape 3 Points	04 28	01 50
Gallitta	37 41	08 44	River Volta	05 55	03 25
Sardinia South End	38 46	09 12	River Formosa	07 00	07 20
Corsica North End	42 56	09 50	Cape Formosa	04 15	06 40
Gorgona	43 34	09 38	New Calabar	04 42	08 33
Captia	43 03	10 17	Old Calabar	04 10	09 45
Lilboa, or Elba	42 45	11 00	River Camerones	03 25	10 10
Messina	38 07	16 20	River de Angra	00 50	10 01
Maritimo	38 12	17 09	C. Lopas	00 55	09 55
Cape Passaro	36 38	15 40	River Congo	05 40	15 25
Malta	35 53	14 32	Angola	08 57	15 56
Corfu	39 42	20 06	Cape Negro	16 08	12 31
Chephalonia	38 15	21 00	Cape St. Thomas	24 10	14 43
Zante	37 46	21 14	Secos	29 00	15 56
Modon or Morea	36 52	21 32	C. Bona Esperance	34 07	19 35
Lemnos	39 59	25 37	**Western Islands.**		
Scio	38 22	26 12	Corvo	39 54	30 55 W
Lissa	43 06	16 40	Flores	39 32	30 54
C. St. John West end of Candy	35 15	24 00	Fyal	38 53	28 15
Cape Solomon, E. end of Candy	35 00	27 08	Pico	38 40	27 20
Rhodes City	36 42	28 05	St. George	38 52	26 03
West end of Cyprus	34 57	32 23	Tercera	38 57	25 34
East-end of Cyprus	35 31	35 00	St. Michael	38 06	23 36
			St. Maries	36 59	23 38
The Coast of Barbary and Guinea.			**The Canary Islands.**		
			Ferro	27 54	17 45 W
Cape Spartel	35 50	05 49 W	Palma	28 40	17 36
Sallee	33 51	06 25	Gomero	28 06	17 05
Cape Cantin	32 36	09 10	Teneriff	28 23	16 28
Cape de Geer	30 27	10 06	Madeira West-end	32 44	17 26
Cape Bajadore	26 04	15 35	Porto Sancto	33 12	15 54
Cape Olorado	23 41	15 50	Canaria	27 52	15 10
Cape Blanco	20 32	17 35	Forteventura SW.	28 05	13 36
Senegall	15 28	16 25	Lancerota	29 02	12 45

Cape

Places Names.	Latitude N. or S. (D. M.)		Longit. E. or W (D. M.)	
Cape de Verde Islands.				
St. Antonio	17	35	24	40
St. Vincent	17	15	24	25
St. Lucia	17	07	24	20
St. Nicholas	17	00	23	38
Brava's	14	28	23	54
Fuego	14	50	23	35
St. Jago	15	08	22	45
Isle of May	15	14	22	08
Isle of Sal	16	50	22	08
Bonavista	16	05	22	08

North Latitude. — West Longitude.

Southern Islands.

Places Names.	Latitude N. or S.			Longit. E. or W		
St. Matthew's	01	30	S	06	01	W
Ascension	07	40	S	14	05	W
St. Helena	16	00	S	c6	04	W
Fernande Poo	02	40	N	10	30	E
Princeps	01	40	N	09	15	E
St. Thomas	00	00		08	20	E
Annabona	02	10	S	07	27	E

The Coast on the Main Continent in the East-Indies.

Places Names.	Latitude N. or S.			Longit. E.		
Cape Lagullas	34	54	S	21	20	
Cape Bon Esperance	34	07	S	19	35	
Cape Corientes	23	40	S	36	17	
Mosambique	15	04	S	41	10	
River de Fuegos	00	41	S	41	15	
Cape Bassos	04	06		47	38	
Cape Guardefoy	11	44		51	20	
Cape Rasulgat	22	41		59	45	
C. Muca or Muscat	23	32		59	45	
Busero	29	45		49	20	
Surat	21	10		72	25	
Goa	15	31		73	50	
Callecut	11	16		75	30	
Cochin	09	54		75	55	
Cape Comerine	07	50		77	25	
Fort St. George	13	11		80	32	

North Latitude. — East Longitude.

Places Names.	Latitude N. or S. (D. M.)		Longit. East (D. M.)	
Diu Point	16	08	81	32
Visagapatam	17	43	83	57
Cape Palmiras	20	42	87	52
Ballasore Road	21	16	87	48
Bengal	22	17	92	21
Cape Negrais	26	23	93	00
Malacca	02	12	102	10
Siam Entrance	14	18	100	55
Cambodia Entrance	10	28	105	00
Cochin	14	05	107	56
Macao	22	13	113	51
Canton	23	14	113	06
Amoy or Quemoy	24	35	116	50
Laimpo	29	59	120	35
Nanquin	33	07	120	01

North Latitude. — East Longitude.

Islands in the East-Indies.

Places Names.	Latitude N. or S.		Longit. East	
Madagascar ⎰ S. end	25	47	46	10
St Laurence ⎱ N end	12	10	51	05
Mayetta	13	10	45	38
Mohilla	12	05	44	23
Comero	11	40	43	50
Juan de Nova	09	30	52	40
Mauritius	20	10	52	55
Diego Royes	19	50	61	30
Romeras de Castela	28	45	67	17
Amsterdam [mas	38	40	72	45
St. Brandon	16	38	64	30
Diego Gratiosa	08	40	68	25
Quabella	03	53	52	36
Bassas de Chagos	06	55	68	45
Yes de Diego Reys	00	20	72	00
Maldivia ⎰ N end	07	14	73	04
⎱ S. end	00	25	76	22
Malique	09	00	72	58
Sacatra	12	21	54	05
Abdeleur	12	04	53	04
C. Gallode Zeylone	06	08	81	15

South Latitude. / N. Latitude. — East Longitude.

Yas

Places Names.	Latitude N. or S — D	M	Longit. E. or W — D	M
Yas de Amber	00	00	52	30
Andaman	11	10	73	19
Nicobar	07	11	93	40
Sumatra NW. End	05	22	94	50
Verkin's Island	02	22	94	07
Nassau Island	02	54	99	32
Bencola	03	55	104	08
Sumatra SE. End	05	22	105	10
Engano or Trompeus	05	50	101	43
Selam	08	20	102	13
Princes Island	06	30	104	02
Bantam in Java	06	11	105	55
Batavia	06	16	106	46
Java East End	08	32	113	30
Straits of Sundy	06	02	105	46
Banca South End	03	20	106	45
Borneo South Point	03	54	113	37
Banda Isles	04	55	127	17
Celebes { South end	05	10	119	07
Celebes { N. end	01	40	121	20
Mindano West point	06	40	119	15
Borneo North Point	07	40	113	05
Luconia { SW. poi.	12	30	120	10
Luconia { NE. poi.	18	55	120	05
Anian { NW. point	19	30	107	00
Anian { NE. point	19	55	109	55
Formosa { S. point	22	00	119	56
Formosa { N. point	25	30	120	45
Piscadore Isles	23	30	118	35
Island Chusan	30	38	120	35
Japan { S.E. point	35	30	140	30
Japan { S.W. point	35	00	128	30

(North Latitude; South Latitude; East Longitude)

The Coast of America in the South Sea, from California to Cape Horn.

Places Names.	Latitude — D	M	Longit. — D	M
Cape St. Sebastian	42	45	127	55
Cape S Lucas or Lucar	23	20	111	46
Cape Corientes	18	50	110	30
Aquapulco	17	05	104	18
Aquatulco	15	27	102	03
Guatimala	14	25	101	00
Panama	08	50	81	52

(North Latitude; West Longitude)

Places Names.	Latitude N or S. — D	M	Longit West — D	M
Bay Bonaventuro	03	24 N	78	06
Island Gallopega	00	00	90	10
Cape del Ajuga	06	30	84	50
Lima	12	15	77	30
Arica	18	29	73	10
La Serena	29	00	76	22
I. Juan Fernandes	33	15	83	18
Baldivia	39	35	81	10
Port Steven	46	50	82	36
Cape Victory	52	00	83	10
Cape Horn	56	35	79	55

(South Latitude; West Longitude)

The Coast of Brazile in South America, from Cape Horn to Cape Roque.

Places Names.	Latitude — D	M	Longit — D	M
Magellan E. entran.	52	00	75	05
River Julian	48	40	74	34
Cape Blanco near R. Camarones	46	50	72	07
Buenos Aires R. Plata	34	35	57	54
River Grand	31	55	52	00
St. Catherine's	27	50	49	00
Cape Frio	23	00	42	20
Spirito Sancto	19	59	42	10
P. Segura	16	31	40	35
Bay Todos Sanctos	12	46	41	00
R. St. Francisco	10	50	37	50
Olinda or Pernambuco	07	48	35	30
Cape St. Augustine	08	35	35	20
Cape Roque	05	00	35	47
Tristian D'Acunha	37	05	13	50
Trinidada	20	30	30	00

(South Latitude; West Longitude)

The Coast of the Main Continent in the West-Indies.

Places Names.	Latitude — D	M	Longit — D	M
R. Amazones Entr.	00	00	49	56
North Cape	02	05	49	56
Suranam	06	25	56	50
Oronoque	08	15	59	25
C. Conquibaca	12	40	70	42
Carthagena	10	28	75	21
Scot's Settlement	08	30	78	45
Nicaragua Entrance	11	25	84	15
Cape Catocha	21	20	86	01

(North Latitude; West Longitude)

Places Names.	Latitude North D. M.	Longit. West. D. M.	Places Names.	Latitude North D. M.	Longit. West D. M
Campecha	19 30 N	92 10 W	Bahama Island	26 50	79 36
La Vera Cruz	19 12 N	97 48 W	Abaco S. Point	26 00	73 46
Mexico	20 00 N	103 35 W	Harbour Island	25 37	76 47
Escondido	30 20 N	89 30 W	Andros N. Point	25 10	78 50
Cape Florida	24 57 N	80 30 W	Providence	25 00	77 20
The Caribbee Islands.			Eleuthera S. point	24 40	75 56
			Cat Island	24 25	75 09
Trinidada	10 15	60 17	Watling's Island	24 03	74 35
Tobago W. End	11 10	59 10	Rum Key	23 45	74 50
Granado	11 57	60 20	Exuma	23 22	75 55
Barbadoes	22 58	58 50	Crooked Isle N. point	22 56	74 12
St. Vincent	13 12	60 12	Atkin's Key	22 17	74 05
St. Lucia	13 55	60 04	Meraparvouz	21 58	74 45
Martinico	14 43	60 54	Atwood Keys	23 10	73 35
Dominico	15 23	60 30	French Keys	22 40	73 40
Marigallante	15 58	60 20	Mayaguana	22 35	72 46
Guardalupa	16 10	61 15	Hogsties	21 17	73 55
Monserat	16 45	62 15	Hyneago W. End	20 52	73 46
Antegua	17 05	61 45	Caicos Bank N. point	20 50	71 15
Nevis	17 05	62 32	Turk's Island	21 35	70 08
St. Christopher's	17 17	62 40	Abrolho N. point	21 35	69 06
Barbuda	17 56	60 40	Platewrack	20 10	68 15
St. Bartholomew	17 52	62 06			
St. Martin's	18 06	62 10			
Anguilla	18 17	62 13			
Virgin's	18 30	63 25			
St. Cruize	17 52	63 30	The Coast of Carolina, Virginia, Maryland, Pensylvania, New-England, and New-foundland.		
Bieque	18 00	63 15			
Porto Rico St John's	18 30	65 37			
St Domingo Hispan.	18 25	69 30			
P. Royal Jamaica	17 40	76 32			
East End of Cuba	20 15	73 55	Charles Town upon Ashly River	32 45	78 46
Havanna	22 40	82 55	Cape Hatteras	35 15	74 20
Bay Hondy	22 45	83 40	Cape Henry	37 00	75 24
Cape St Antonio	21 45	85 32	Cape Charles	37 16	74 16
Bahama Islands.			Cape Hinlopen	38 50	74 56
Bermudas	32 25 N	63 40 W	Long Island	40 50	72 45
N. Point Bahama Bank	27 50 N	78 35 W	New York	40 58	73 53
			Cape		

Places Names	Latitude North		Longit. West		Places Names.	Latitude North		Longit. E or W.	
	D.	M.	D.	M		D.	M	D.	M
Cape Cod	42	12	68	55	The Coast of Iceland, Greenland, Nova Zembla, and the Northern Isles.				
Boston Entrance	42	30	69	23					
Cape Sable	43	50	64	58					
Island Sable	44	20	59	01					
Cape Britain	46	00	58	30	Sound Royal	66	22	24	33
Quebeck	46	55	69	48	Bargarer's Point	66	20	16	35
Bay of Brest	52	10	56	57	Whales Back	65	27	20	33
Bell Island	52	07	55	35	Merchants Foreland	63	25	17	05
Cape St. John	50	25	52	48	Halliford	64	30	34	43
Cape Bonavista	49	15	52	12	Fair Foreland	66	20	26	27
Trinity Bay Entr.	48	52	52	20	Grim's Island	67	15	22	34
Conception Bay En.	48	20	52	08	Westmania Isles	63	30	22	54
St. John's Harbour	48	00	51	39	Isles of Fero	62	06	05	00
Bay of Bulls	47	50	51	29	Beerenberg, or John Main's Isle.	71	45	04	30
Cape Race	46	40	51	52					
Cape St. Mary	47	10	53	23	Point Lookout	76	25	15	36
Placentia Bay	47	45	53	58	Horn Sound	76	45	13	36
Cape Roy	48	00	57	40	Fair Foreland	79	20	10	52
					Hacluit's Headland	79	55	11	00
					Helie's Sound	78	55	21	50
The Coast of Hudson's Bay and the Straits.					Lee's Foreland	78	05	23	25
					Whale's Head	77	18	21	30
					Hope Island	76	18	23	45
					Cherry or Bear Isle	74	30	18	08
Buttons Isles	60	25	66	27	Admiralty Island	75	05	55	50
Cape Charles	62	10	75	35	Fretum Borough	70	00	61	20
Cape Walsingham	62	35	77	55	Cape Candenose	69	05	42	35
Mansfield Isle	61	42	80	30	Catnose	65	43	35	14
Cape Jones	54	55	78	58	Archangel	64	30	40	30
Rupert's River	51	30	79	26	Crofs Island	66	31	36	33
Albany Fort	52	26	84	50	Sweetnose	68	10	34	45
The Cubb's	54	10	82	40	Kilduyn	69	30	31	20
C. Henrietta Maria	55	07	84	30	North Cape	71	23	23	02
Port Nelson	57	10	93	58	Surroy Isle	71	05	16	40
Cape Churchil	59	00	95	20	Tromsound	70	25	15	30
C. Southampton	61	55	86	48	Loefort SW. Point	68	15	09	40
Shark Point	64	30	82	55	Dronten	63	40	10	15
Nottingham Isle	63	30	79	53	Stadland	62	10	04	38
Q. Ann's Foreland	63	48	74	45	North-bergen	60	10	05	40
Resolution Isle	61	50	65	04	Naze of Norway	57	45	07	24
Cape Farewell	59	45	46	45					

K 2

Sea

Places Names.	Latitude North.		Longit. East.		Places Names.	Latitude North.		Longit. East.	
Sea-Coast in the Sound, & Baltic Sea.	D.	M.	D.	M.		D.	M.	D.	M.
Maerden, or Mardel	58	19	08	57	Narva	59	27	28	25
Larwic	58	54	09	20	Revel	59	27	24	51
Chriſtiana	59	40	10	00	Riga	57	04	25	15
Maeſterland	57	53	11	45	Derwinda	57	15	22	06
Gottenberg Gat	57	50	12	15	Coningsburg	54	43	21	35
Elſenore	56	22	12	42	Dantzic	54	22	18	36
Roſtock	54	37	18	40	Wiſby in Gotland	57	30	18	30
Copenhagen	55	41	12	50	Bornholm	55	15	14	45
Valſterborn	55	28	13	00	Straelſund	54	25	13	16
Uraniburg	55	54	12	58	Lubec	54	06	09	55
Calmer	56	40	16	35	Anout, or Anholt	56	50	11	06
Stockholm	59	20	19	30	Leſou, or Leſnou	57	05	10	30
Wyburg	60	52	29	16	Scaw	57	30	10	20
Petersburg	60	00	30	25					

Note: "North Latitude." and "Eaſt Longitude." labels appear vertically in the columns on both the left and right sections of the table.

Problems of Plane Sailing, wrought by Logarithms, and by Gunter's-Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſails South Weſt by South 382 Minutes, and the Difference of Latitude and Departure are required.
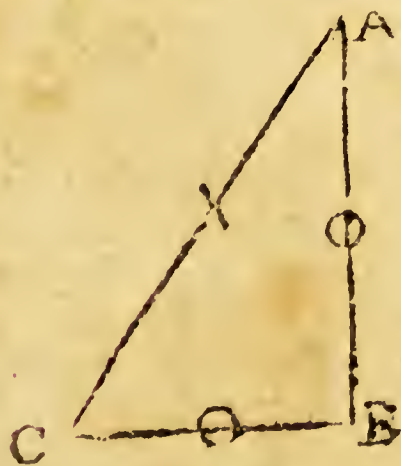
In the Right-angled Triangle ABC.
AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe.
ACB (or the Angle at C) the Complement of the Courſe to 90 deg.

Characters

Characters *used in* Navigation *and* Astronomy.

S. stands for Sine.
T. for Tangent.
S. c. Sine Complement.　　T. c. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a dash (').
The required Sides and Angles with a Cypher thus (°).

The Operation by Logarithms.　*For the Difference of Latitude.*

As Radius——————————————————	10.000000
To the Distance sailed 382 Minutes———————————	2.582063
So is the S. c. of the Course 56d. 15m. —————————	9.919846
To the Difference of Latitude 317.6 Minutes ———————	2.501909

For the Departure.

As Radius ———————————————————	10.000000
To the Distance sailed 382 Minutes ————————————	2.582063
So is the S. of the Course 33d. 45m. ———————————	9.744739
To the Departure 212.2 Minutes ———————————	2.326802

The Operation by Gunter's Scale.

One Foot of the Compasses being in the Radius, or S. of 8 Points; extend the other to the Distance 382 Minutes, the said Extent laid from S. Course 3 Points will reach to 212.2 Minutes, the Departure from the Meridian, and the Compasses kept at the same Distance will reach from the S. c. Course 5 Points to 317.6 Minutes, the Difference of Latitude as above.

PROB. II. The Course and Difference of Latitude given, to find the Distance and Departure.

Suppose a Ship sails WSW. until the Difference of Latitude be 219 Leagues, and the Distance and Departure required.
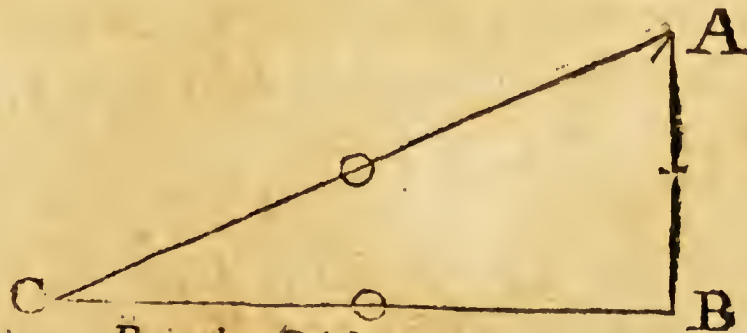
The Operation by Logarithms.　*For the Distance*

As the S. c. of the Course 22d. 30m. —————————	9.582840
To the Difference of Latitude 219 Leagues ——————	2.340444
So is Radius —————————————————————	10.000000
To the Distance, which is 572.2 Leagues ———————	2.757604

For

For the Departure.

As Radius———————————— 10.000000
To the Diftance 572.2 Leagues found before——————— 2.757548
So is the Sine of the Courfe 67 deg. 30 min. ———— 9.965615
To the Departure 528.6 Leagues——————————— 12.723163

By Gunter.

The Compaffes being extended from the S. of 2 Points, the Comple-ment of the Courfe to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572.2 Leagues, the Diftance, and the fame Extent of the Compaffes from the Sine of the Courfe 6 Points, will reach to 528.6 Leagues, the Departure.

PROB. III. The Courfe and Departure given, to find the Diftance and Difference of Latitude.

Suppofe a Ship fails North Eaft by Eaft, and her Departure be 220 Minutes, the Diftance and Difference of Latitude required.

By Logarithms. *For the Diftance.*

As the S. of the Courfe 56 deg. 15 min. ——————— 9.919846
To the Departure 220 Minutes —————————— 2.342423
So is Radius —————————————— 10.000000
To the Diftance 264.6 Minutes ————————— 2.422577

For the Difference of Latitude.

As Radius ——————————————— 10.000000
To the Diftance 264.6 Minutes—————————— 2.422590
So is the S.c. of the Courfe 33 deg. 45 min.————— 9.744739
To the Difference of Latitude 147 Minutes ———— 12.167329

By Gunter.

The Extent of the Compaffes from the S. of the Courfe 5 Points to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 264.6 the Diftance; and the fame Extent of the Compaffes from S. 3 Points the Complement of the Courfe, will reach to the Difference of Latitude 147 Minutes, as above.

PROB. IV. The Diftance and Difference of Latitude given, to find the Courfe and Departure.

Sup-

Suppofe a Ship fails between the North and the Weft 206 Miles, until the Difference of Latitude be 197 Miles, the Courfe and Departure required.
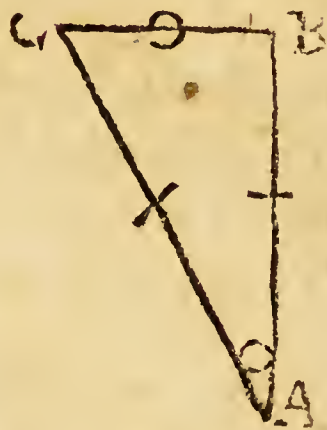
By Logarithms. *For the Courfe.*

As the Diftance 206 Miles ———— ———— ———— ————	2.313867
To the Radius ——— ———— ———— ————	10.000000
So is the Difference of Latitude 197 Miles ———— ————	2.294466
To the S.c. of the Courfe; which is N. 17d. 00m. Weft————	9.980599

For the Departure.

As the Radius ——— ———— ———— ————	10.000000
To the Diftance 206 Miles — ———— ———— ————	2.313867
So is the S. of the Courfe 17 deg. 00 min.— ———— ————	9.465935
To the Departure 60.23 Miles — ——— ———— ————	11.779802

By Gunter.

For the Courfe. The Extent from the Diftance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courfe, which fubtracted from 90d. is 17d. 00m. the Courfe N. Wefterly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90d. to the Sine of the Courfe 17 deg. 00 min. will reach from the Diftance 206 Minutes, to the Departure 60.23 Minutes as above.

PROB. V. the Diftance and Departure given, to find the Courfe and Difference of Latitude.

Suppofe a Ship fails between the South and the Weft 247 Minutes, until the Departure be 197 Minutes, required the Courfe and Difference of Latitude.
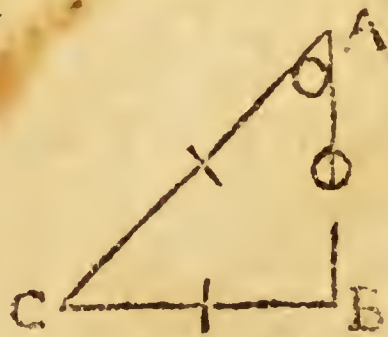
The Operation by Logarithms. *For the Courfe.*

As the Diftance 247 Minutes — — — ————	2.392697
To the Radius——— ———— ———— ————	10.000000
So is the Departure 197 Minutes — ———— ————	2.294466
To the Sine of the Courfe S. 52 deg. 54 min. Wefterly ————	9.901769

For the Difference of Latitude.

As Radius ——— ——— ——— ——— ——— ——— 10.000000
To the Diftance 247 Minutes —. ——— ——— ——— 2.392697
So is the S. c. of the Courfe 37 deg. 6 min.— ——— ——— 9.780467
To the Difference of Latitude 149 min. ——— ——— ——— 12.173164

By Gunter.

For the Courfe. The Extent of the Compaffes from the Diftance 247 Minutes, to the Departure 197 Minutes, will reach the fame way from Radius S. 90 deg. to the Sine of the Courfe 52 deg. 54 min. South Weft-erly, or South Weft three quarters Weft.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to S. 37 deg. 6 min. the Complement of the Courfe, will reach the fame way from the Diftance 247 min. to the Difference of Latitude 149 min.

PROB. VI. The Difference of Latitude and Departure given, to find the Courfe and Diftance.
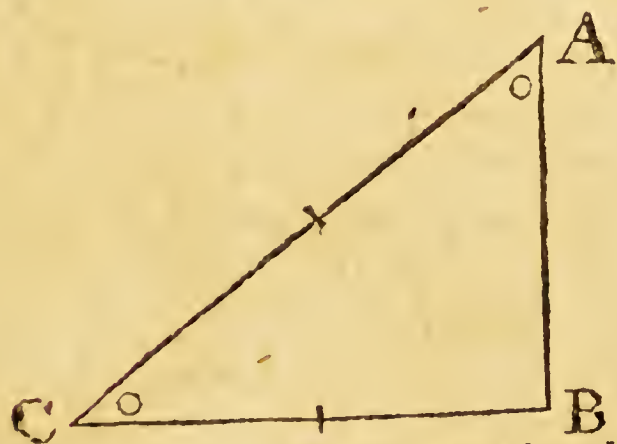
Suppofe a Ship fails between the South and the Weft, until the Difference of Latitude be 154 Leagues, and her Departure 200 Leagues; required the Courfe and Diftance.

The Operation by Logarithms. *For the Courfe.*

As the Difference of Latitude 154 Leagues ——— ——— 2.187521
To Radius ——— — ——— ——— ——— ——— 10.000000
So is the Deprrture 200 Leagues — — ——— — ——— 2.301030
To the Tangent of the Courfe 52d. 24m. South W.erly — 10.113509

For the Diftance.

As the S.c. of the Courfe 37 deg. 36 min. — ——— ——— 9 785433
To the Difference of Latitude 154 Leagues — ——— ——— 2.187521
So is the Radius ——— ——— ——— ——— ——— 10.000000
To the Diftance 252.5 Leagues — ——— ——— ——— 2.402088

By Gunter.

For the Courfe. The Extent of the Compaffes from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, will reach from Radius or Tangent of 45 deg. to the Tangent of the Courfe, 52 deg. 24 min. South Wefterly, or South Weft three quarters Weft.

For the Diftance. The Extent from the S. 37 deg. 36 min. the Complement of the Courfe, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Diftance 252.5 Leagues.

PROB

P R O B. VII.

This Problem fhews the manner of working a Traverfe ; and is very ufeful in keeping a Reckoning by Plane Sailing.

Example.

Suppofe a Ship bound to a certain Port, and fails firft SSW. 40 minutes, then SW. 60 min. then S. by E. 63 min. then WSW, 49 min. then S. E. by S. 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Courfe and Diftance is required.

The Operation by Logarithms.
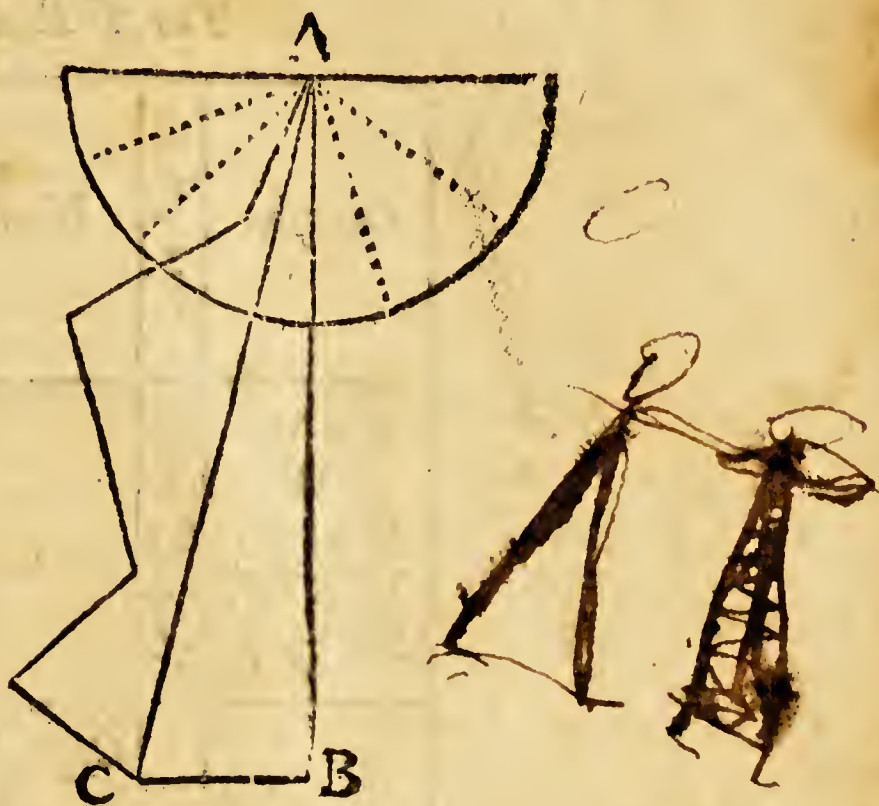
For the Difference of Latitude for the firft Courfe.

As Radius ————————————————————	10.000000
To the Diftance 40 min. ————————————	1.602060
So is the S.c. of the Courfe 67d. 30m. —————	9.965615
To the Difference of Latitude 36.95 min. ————	11.567675

For the Departure of the firft Courfe.

As Radius ————————————————————	10.000000
To the Diftance 40 min. ————————————	1.602060
So is the S. of the Courfe 22d. 30m. —————	9.582840
To the Departure 15.31 min. —————————	11.184900

By Gunter.

The Extent of the Compaffes from Radius the S. of 8 Points, to the Diftance 40 min. that Extent in the Compaffes laid from the Sine of the Courfe 2 Points will reach to 15.3 min. the Departure, and the Compaffes being kept to the fame Extent, and laid from the S. 6 Points, the Complement of the Courfe, will reach to 36.9 min. the Difference of Latitude.

In the fame manner proceed to find the Difference of Latitude and Departure for each Courfe and Diftance ; which being found, place in a Table as follows.   L   the

The TRAVERSE-TABLE.

Courses.	Distance.	North.	South.	East.	West.
S S W.	40		37.0		15.3
S W.	60		42.4		42.4
S by E.	63		61.8	12.3	
W S W.	49		18.8		45.3
SE by S.	56		46.6	31.1	
	Diff. Lat.	206.6		43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the TABLE.

In placing the Difference of Latitude and Departure in their proper Columns, obferve, that if the Courfe be Northerly, the Difference of Latitude is put in the North Column; if it be Southerly, in the South Column; and if the Courfe be Eafterly, the Departure is put in the Eaft Column; if Wefterly, in the Weft Column.

Thus having framed the Table, add up the North, South, Eaft, and Weft Columns feverally, whereby the Difference of Latitude appears to be 206.6 Minutes South, becaufe there is nothing in the North Column; The Departure 59.6 Minutes Weft, becaufe by fo much the Weft Column exceeds the Eaft: then by this Difference of Latitude and Departure, find the direct Courfe and Diftance as follows.

The Operation by the Logarithms. *For the direct Courfe.*

As the Difference of Latitude 206.6 min.————— 2315130

To the Radius ————————————————— 10.000000

So is the Departure 59.6 min. ————————— 1.775246

To the T. of the Courfe 16d. 5m. South Wefterly, becaufe } 9.460116
the South and Weft Columns exceeds the North and Eaft }

For the Diftance.

As the S.c. of the Courfe 16d. 5m. ——————— 9.982660

To the Difference of Latitude 206.6 min. ———— 2.315130

So is Radius ————————————————— 10·000000

To the Diftance required 215 min.————————— 2.332470

By

By Gunter. *For the direct Course.*
The Extent of the Compasses from the Difference of Latitude 206.6m. to the Departure 59.6m. will reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Course required.

For the Distance.

The Extent from S. 73 deg. 55 min. the Complement of the Course, to S. 90 deg. *viz.* Radius, will reach from the Difference of Latitude 206.6m. to the Distance 215 Minutes.

Oblique-angled Plane Triangles, applied in PROBLEMS *of* Plane - Sailing, *and wrought by* Logarithms, *and* Gunter's-Scale.

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian, a Ship sails from the Northermost SE. 206 Miles, another Ship sails from the Southermost North East by North, a certain Number of Miles, and meets with the first Ship; the Distance between these two Ports, and the Distance sailed by the second Ship is required.
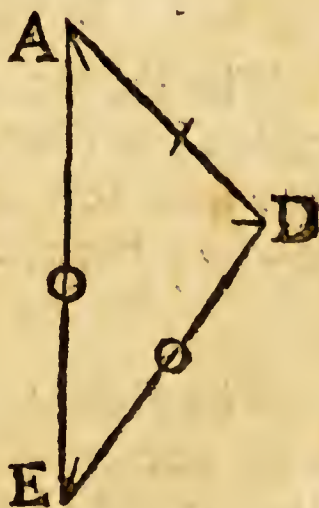
In the Triangle ADE.

A and E represents the two Ports. AD the first Ship's Distance. ED the second Ship's Distance. AE the Distance between the two Ports.

The Operation by Logarithms. *For the Distance between the two Ports.*

As S. AED 33d. 45m. ——————————— Co. Ar. 0.255261
To AD the first Ship's Distance 206 min. ——————— 2.313867
So is S. ADE 101d. 15m. which subtracted from 180d. —— 9.991574
To AE, the Distance between the two Ports 363.7 min. —— *12.560702*

In all Proportions where Radius is not one of the three given Terms, to save the Labour of subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm

rithm, which is found by subtracting each Figure of the Logarithm from 9, except the first towards the Right-hand, which is subtracted from 10, as in the Operation, the Logarithm Sine found in the Table is, 9.744739, wherefore beginning at the Left-hand, say 9 from 9 there remains 0 ; 7 from 9 there remains 2 ; 4 from 9 there remains 5 ; 4 from 9 there remains 5 ; 7 from 9 there remains 2 ; 3 from 9 there remains 6 ; 9 from 10 there remains 1 ; So the Complement Arithmetical of the first Logarithm, is 0.255261, which added to the other two Logarithms, and from that Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. subtract the Degree and Minute from 180d. the Sine of the Remainder (called the Supplement) is the Sine required.

For the Second Ship's Distance.

As S. AED. 33d. 45m. —————————— Co. Ar. 0.255261
To AD the first Ship's Distance 206 min. ——————— 2.313867
So is S. DAE 45d. 00m. ——————————— 9.849485
To DE the second Ship's Distance, 262.2 min. —————— 12.418613

By Gunter. For the Distance between the two Ports.

The Extent of the Compasses from S. of 33 deg. 45 min. to the S. ADE 78d. 45m. (*viz.* the Supplement of 101d. 15m. to 180d.) will reach from 206 min. the first Ship's Distance, to 363.7 min. the Distance between the two Ports, as above.

For the second Ship's Distance.

The Extent of the Compasses from the S. of 33d. 45m. to the S. of 45d. 00m. will reach from 206 min. the first Ship's Distance, to 262.2 min. the second Ship's Distance required.

PROB. II.

Two Sides and an Angle opposite to one of them being given, to find the other opposite Angle and the third Side.

Example.

Suppose two Ports, whose Bearing is North East and South West, distant 396 Miles, a Ship at the northermost sails South South East, and another Ship at the southermost sails thence 518 Miles, and meets with the first Ship : The Course sailed by the second Ship, and the first Ship's Distance are required.

In
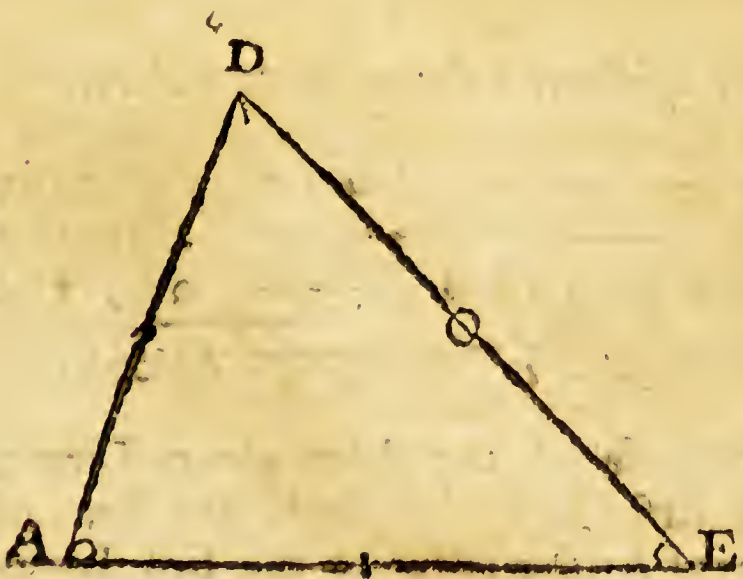
In the Triangle A D E.

A reprefents the Southermoft Port, D the Northermoft.
AD the Diftance between the two Ports.
DE the Courfe and Diftance failed by the firft Ship.
AE the Courfe and Diftance failed by the fecond Ship.

The Operation by Logarithms. *For the fecond Ship's Courfe.*

As AE the fecond Ship's Diftance 518 min. ——— —— Co. Ar. 7.285671
To S. ADE 67d. 30m. —— ——— ——— ——— ——— 9.965615
So is AD the Diftance between the two Ports 396 min. —— 2.597695
To S. AED 44 deg. 56 min. ——— —— ——— ——— —— 19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and fubtracted from 180d. gives 67d. 34m. the Angle at A, which makes neareft 6 Points, and 6 Points reckon'd from the North Eaft to the Southward gives ESE. the fecond Ship's Courfe required.

For the firft Ship's Diftance.

As S. ADE 67d. 30m.——— —— ——— ——— —Co. Ar. 0.034385
To AE the fecond Ship's Diftance 518m. ——— ——— —— 2.714330
So is S. DAE 67 deg. 34 min.——— ——— —— ——— — 9.965824
To DE the firft Ship's Diftance 518.3 min.——— ——— —— 12.714539

By Gunter. *For the fecond Ship's Courfe.*

The Extent of the Compaffes from 518 min. to S. 67d. 30m. will reach from 396 min. to S. 44 deg. 56 min. which added to the Angle at D, and the Sum fubtracted from 180d. gives 67d. 34m. the Angle at A, as above.

For the firft Ship's Diftance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34m. to 518.3 m. the Ship's Diftance, as above.

P R O B. III.

Two Sides and the contained Angle given, to find the other Angles and Side.
Example.

Suppofe two Ships fail from one Port; one fails NE. 140 Miles, the other South Eaft by Eaft 115 Miles, the Bearing and Diftance of thefe two Ships is required.

Let D reprefent the Port, DA the firft Ship's dif-
tance, and DE the fecond.

Miles
140
115
255
Diff. 25
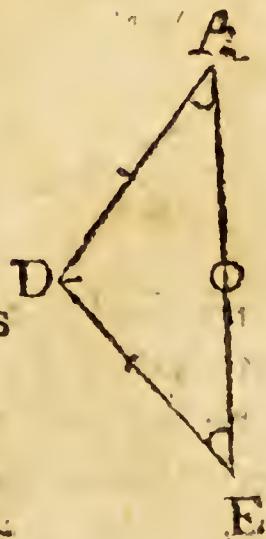
The Operation by Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 min. ———— Co. Ar. 7.593460
To the Difference of the faid Sides 25 min.————————— 1.397940
So is the T. of half the Sum of their oppofite Angles 50d. 37m. 10.085698
To the T. of half their Difference, which is 6d. 48m.——— 19.077098

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference fubtracted from it gives 43d. 49m. the leffer Angle DAE. Wherefore the Bearing of the two Ships is N. Eafterly, and South Wefterly 1d. 11m. *For the Diftance of the two Ships.*

As S. AED 57d. 25m. ————————— Co. Ar. 0.074374
To AD the firft Ship's Diftance 140 min. ———————— 2.146128
So is S. ADE 78d. 45m.————————————— 9.991574
To AE the Diftance of the Ships, 163 min. ————— 12.212076

By Gunter. *For the Bearing of the two Ships.*

The Extent of the Compaffes from the Sum of the Sides 255m. to their Difference 25m. will reach from the T. of the Half Sum of the required Angles 50d. 37m. to the T. of half the Diff. of the faid Angle 6d. 48m.

In this Proportion by *Gunter*, the Practitioner may be at a Lofs, becaufe the Point T. 50d. 37m. would fall beyond the T. of 45d. was the Tangent Line continued: To remedy which, place the Extent from 255 to 25, from the T. 45d. and it will reach to the T. of 5d. 37m. then letting one Point ftand at 5d. 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. will fall on the T. 6d. 48m. required. *For the Diftance of the Ships.*

The Eetent from the Sine of 57d. 25m. to the Sine of 78d. 45m. will reach from 140m. to 163m.

P R O B. IV. Three Sides being given, to find the Angles.

Example. Suppofe there are two Ports both in one Latitude, diftant 536 Miles; a Ship fails from the Eaftward 306 Miles between the South and the Weft; another Ship fails from the Weftermoft 290 Miles, and meets with the firft Ship. The Courfe that each Ship hath fteered is required.

Let A and E reprefent the two Ports, D the Place where the Ships meet. This Queftion is refolv'd by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles A B D and EBD, then the Operation is as follows;
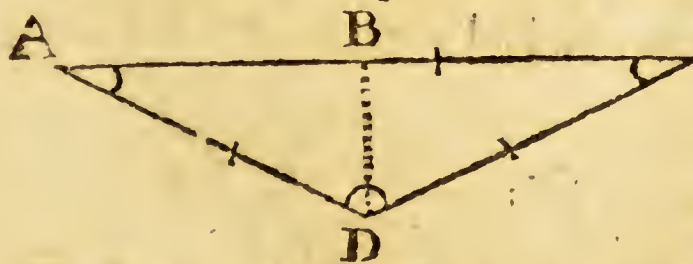
Firft, find the Segment of the Bafe BE, thus,

As the Bafe AE, 536 Miles ———————————— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596 Miles——————— 2.775246
So is the Difference of the faid Sides 16 Miles —————— 1.204120
To the Diff. of the Segments of the Bafe, which is 17.8 Miles 11.250201

The

The whole Bafe——————————— 536 min.
The Difference of the Segments is——— 17.8
Sum is——————————————— 553.8
Half Sum ——————————————— 276.9 the greater Segment BE.

Then fay, *For the firft Ship's Courfe.*

As DE the firft Ship's Diftance 306 min. ———————— 2.485721
To Radius————————————————— 10,000000
So is the greateft Segment BE 276.9 min. ————— 2.442323
To S.c. BED, 25d. 9m. ——————————— 9,956602

The Angle at E is the Courfe from the Weft Southerly, fo the firft Ship fteers South 64d. 51m. Weft, or SW. by W. three quarters Weft almoft.

For the fecond Ship's Courfe.

As AD the fecond Ship's Diftance 290 min. ——— Co. Ar. 7.537602
To Sine AED 25d. 9m. ———————————— 9.628378
So is DE the firft Ship's Diftance 306 ——————— 2.485721
To Sine DAE 26d. 39m. ——————————— 9.651701

The Angle at A is the Courfe from the Eaft Southerly, fo the fecond Ship fteers South 63d. 21m. Eaft, or SE. by E. 3 quarters E. nearly.

By Gunter. *For the Difference of the Segments of the Bafe.*

The Extent of the Compaffes from the Bafe AE 536 min. to the Sum of the Sides 596m. will reach from the Difference of the Sides 16, to the Difference of the Segments of the Bafe 17.8, with which proceed as before.

For the firft Ship's Courfe.

The Extent from the Diftance 306 min. to the greater Segment 276.9 min. will reach from Radius or Sine 90d. to Sine 64d. 51m. the Complement BED 25d. 9m. required.

For the fecond Ship's Courfe.

The Extent from 290m. the fecond Ship's Diftance, to 306 min. the firft Ships Diftance, will reach from the Sine 25d. 9m. to the Sine 26d. 39m. the Angle at A required.

PROB. V.

Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships fails from one Port at A; the firft fails Eaft 335 Miles to B, the fecond fails Eaft 14d. 40m. North, 271 Miles to C; I demand how far they are afunder, and what is the Courfe from the Ship at C, to that at B?

In the Triangle ABC,
    there is given,

AB 335
AC 271   } BC required.
BAC 14d. 40m.
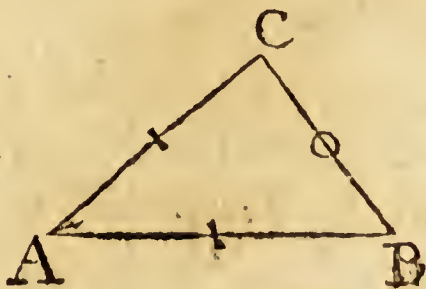
This

This Cafe requires a double Operation———————————— AB 335
1. By the third Cafe to find the Angles ——————————— AC 271
2. By the firſt Cafe to find the Side required——————— Sum is 606
                                                      Diff. is 64

The firſt Operation.

As the Sum of the Sides AB and AC 606 Miles ———— Co. Ar. 7.217527
To their Difference ——————————— 64 ————————— 1.806180
So is the T. of half Sum of the Angles 82d. 40m. ——————— 10.890441
To T. half their Difference —————— 39d. 22m. ——————— *x*9.914148
    By which you will find the Angle ABC, to be 43d. 18m.

The ſecond Operation.

As S. ABC 43d. 18m.———————————————— Co. Ar. 0.163791
To the Side AC 271 Miles ——————————————— 2.432969
So is S. BAC 14d. 40m. —————————————————— 9.403455
To the Side BC 100 Miles———————————————— *x*2.000215
    The Angle at B is found to be 43d. 18m. and the Line AB lying
Eaſt and Weſt, the Courſe from C to B is Eaſt 43d. 18m. South, or South
Eaſt 1d. 42m. Eaſterly ; and the Diſtance 100 Miles.

By Gunter. *For the Angle at* B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Dif-
ference of the Sides, will reach from the Tangent of 82d. 40m. half the
Sum of the unknown Angles; to the Tangent of 39d. 22m. half their
Difference, which being found, proceed according to former Directions,
to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m.
the Angle at A ; will reach from 271 Miles the Side AC, to 100 Miles,
the Side BC, as above.

Thus much for Sailing by the *Plane Chart* ; which being of ſome Uſe in
ſhort Voyages, and a good Foundation for further Improvement, we were
not willing wholly to omit ; but neverthelefs would advife all that take
Charge of Ships never to content themfelves with the Uſe of the *Plane
Chart* only ; being ſo apparently falfe in itfelf, and ſo unfafe for Practice :
Nor are we under any Neceffity to truſt to it, the Defect thereof being
now ſufficiently ſupplied by Mr. *Wright*'s True Chart, commonly called
Mercator's, the Projection and Uſe of which (both in ſingle Queſtions
and Traverfes) are largely treated of and rendered as eafy as the *Plane
Chart*, in the Book called *Practical Navigation*, (and at this Time
treated off by many others, fold at the ſame Place) firſt ſet forth by Mr.
John Seller, and now Corrected and Reprinted for W. and J. M o u n t,
T. P a g e and S o n, on *Tower-hill*, with many ufeful Additions.

A

A Large and very uſeful

TABLE

OF

DIFFERENCE

OF

Latitude and *Departure*

IN

MINUTES and Tenth Parts,

TO

Every *Degree* and *Quarter-Point*

OF THE

COMPASS,

For the Exact Working of a

TRAVERSE.

Dist.	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	89 Deg.		88 Deg.		7¼ Point		87 Deg.		86 Deg.		85 Deg.		

Dist.	1 Deg. Lat	Dep	2 Deg. Lat	Dep	¼ Point Lat	Dep	3 Deg. Lat	Dep	4 Deg. Lat	Dep	5 Deg. Lat	Dep	Dist.
51	51,0	00,9	51,0	01,8	50,9	02,5	50,9	02,7	50.9	03.6	50.8	04.4	51
52	52,0	00,9	52,0	01,8	51,9	02,6	51,9	02,7	51.9	03.6	51.8	04.5	52
53	53,0	00,9	53,0	01,8	52,9	02,6	52,9	02,8	52.9	03.7	52 8	04.6	53
54	54,0	00,9	54,0	01,9	53,9	02,7	53,9	02,8	53,9	03.8	53.8	04.7	54
55	55,0	01,0	55,0	01,9	54,9	02,7	54,9	02,8	54,9	03 8	54.8	04 8	55
56	56,0	01,0	56,0	02,0	55,9	02,7	55,9	02,9	55.9	03.9	55.8	04.9	56
57	57,0	01,0	57,0	02,0	56,9	02,8	56,9	03,0	56.9	04.0	56.8	05 0	57
58	58,0	01,0	58,0	02,0	57,9	02,8	57,9	03,0	57.9	04.0	57.8	05.1	58
59	59,0	01,0	59,0	02,1	58,9	02,9	58,9	03,1	58.9	04.1	58.8	05.1	59
60	60,0	01,0	60,0	02,1	59,9	02,9	59,9	03,1	59,9	04 2	59.8	05.2	60
61	61,0	01,1	61,0	02,1	60,9	03,0	60,9	03,2	60.9	04.3	60.8	05.3	61
62	62,0	01,1	62,0	02,2	61,9	03,0	61,9	03,2	61,9	04.3	61.8	05.4	62
63	63,0	01,1	63,0	02,2	62,9	03,1	62,9	03,3	62,8	04.4	62.8	05.5	63
64	64,0	01,1	64,0	02,2	63 9	03,1	63,9	03,3	63,8	04 5	63.8	05.6	64
65	65,0	01,1	65,0	02,3	64,9	03,2	64,9	03,4	64 8	04 5	64.8	05.7	65
66	66,0	01,2	66,0	02,3	65,9	03,2	65,9	03,5	65.8	04.6	65 7	05.8	66
67	67,0	01,2	67,0	02,3	66,9	03,3	66,9	03,5	66.8	04.7	66.7	05.8	67
68	68,0	01,2	68,0	02,4	67,9	03,3	67,9	03,6	67,8	04.7	67.7	05.9	68
69	69,0	01,2	69,0	02,4	68,9	03,4	68,9	03,6	68,8	04.8	68.7	c6.0	69
70	70,0	01,2	70,0	02,4	69,9	03,4	69,9	03,7	69,8	04.9	69.7	06.1	70
71	71,0	01,2	71,0	02,5	70,9	03,5	70,9	03,7	70.8	05.0	70 7	06 2	71
72	72,0	01,3	72,0	02,5	71,9	03,5	71,9	03,8	71.8	05.0	71.7	06,3	72
73	73,0	01,3	73,0	02,5	72,9	03,6	72,9	03,8	72.8	05.1	72.7	c6.4	73
74	74,0	01,3	74,0	02,6	73,9	03,6	73,9	03,9	73.8	05.2	73.7	c6.5	74
75	75,0	01,3	75,0	02,6	74,9	03,7	74,9	03,9	74.8	05 2	74.7	06.5	75
76	76,0	01,3	76,0	02,7	75,9	03,7	75,9	04,0	75.8	05.3	75.7	06.6	76
77	77,0	01,3	77,0	02,7	76,9	03,8	76,9	04,0	76.8	05.4	76.7	06.7	77
78	78,0	01,4	78,0	02,7	77,9	03,8	77,9	04,1	77.8	05.4	77.7	c6.8	78
79	79,0	01,4	79,0	02,8	78,9	03,9	78,9	04,1	78,8	05.5	78.7	06 9	79
80	80,0	01,4	80,0	02,8	79,9	03,9	79,9	04,2	79.8	05.6	79.7	c7.0	80
81	81,0	01,4	81,0	02,8	80,9	04,0	80,9	04,2	80.8	05 7	80.7	07.1	81
82	82,0	01,4	81,9	02,9	81,9	04,0	81,9	04,3	81,8	05.7	81.7	07.2	82
83	83,0	01,5	82,9	02,9	82,9	04,1	82,9	04,3	82.8	05.8	82.7	07.2	83
84	84,0	01,5	83,9	c2,9	83,9	04,1	83,9	04,4	83.8	05.9	83 7	07.3	84
85	85,0	01,5	84,9	03,0	84,9	04,2	84,9	04,4	84,8	05.9	84.7	07.4	85
86	86,0	01,5	85,9	03,0	85,9	04,2	85,9	04,5	85.8	06.0	85 7	07.5	86
87	87,0	01,5	86,9	03,0	86,9	04,3	86,9	04,6	86.8	06.1	86.7	07.6	87
88	88,0	01,5	87,9	03,1	87,9	04,3	87,9	04,6	87.8	06.1	87.7	07.7	88
89	89,0	01,6	88,9	03,1	88,9	04,4	88,9	04,7	88.8	06.2	88.7	07.8	89
90	90,0	01,6	89,9	03,1	89,9	04,4	89,9	04,7	89.8	06.3	89.7	07.8	90
91	91,0	01,6	90,9	03,2	90,9	04,5	90,9	04,8	90.8	06.4	90.7	07.9	91
92	92,0	01,6	91,9	03,2	91,9	04,5	91,9	04,8	91,8	06.4	91 6	08.0	92
93	93,0	01,6	92,9	03,2	92,9	04,6	92,9	c4,9	92.8	06.5	92.6	08.1	93
94	94,0	01,6	93,9	03,3	93,9	04,6	93,9	04,9	93.8	c6.6	93.6	08.2	94
95	95,0	01,7	94,9	03,3	94,9	04,7	94,9	05,0	94,8	06.6	94.6	08 3	95
96	96,0	01,7	95,9	03,4	95,9	04,7	95,9	05,0	95.8	06.7	95.6	08.4	96
97	97,0	01,7	96,9	03,4	96,9	04,8	96,9	05,1	96,8	06.8	96.6	08.5	97
98	98,0	01,7	97,9	03,4	97,9	04,8	97,9	05,1	97.8	06.8	97.6	08 5	98
99	99,0	01,7	98,9	03,5	98,9	04,9	98,9	05,2	98.8	06.9	98.6	08,6	99
100	100,0	01,7	99,9	03,5	99,9	04,9	99,9	05,2	99,8	07.0	99 6	08.7	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Point		87 Deg.		86 Deg.		85 Deg.		

Dif.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dif.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06 0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	co.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01 6	12.9	01.8	12.9	01 9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	c2.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02 8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03 2	25.7	03.6	25.7	03 8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03 0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29 6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03 3	31.8	03.9	31.7	04 5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34 8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03 8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04 5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37 6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05 0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05 4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44 6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07,2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07 3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06 1	49.5	07.0	49.5	07.3	49.4	07.8	50
Dif.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dif.
	7½ Points		84 Deg		83 Deg.		82 Deg.		7¼ Point		81 Deg.		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Point		84 Deg.		83 Deg		82 Deg.		7¼ Point		81 Deg.		

Dift.	10 Deg. Lat	10 Deg. Dep	11 Deg. Lat	11 Deg. Dep	1 Point Lat	1 Point Dep	12 Deg. Lat	12 Deg. Dep	13 Deg. Lat	13 Deg. Dep	14 Deg. Lat	14 Deg. Dep	Dift.
1	01.0	00.2	01.0	00.2	01.0	00.2	02.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02 0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01 5	07.8	01.6	07.8	01.7	07.8	01 8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03 1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03 0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18 4	04.6	19
20	19.7	03 5	19.6	03 8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20 5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27 3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28 4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05 7	29.4	05 9	29.3	06.2	29.2	06.7	29 1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30 2	07.0	30.1	07 5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06 3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34 1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	07.6	38 1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39 3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08 2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43 3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44 0	09.4	43.8	10 1	43.7	10 9	45
46	45.3	08.0	45.2	08 8	45.1	09.0	45 0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09 0	46.1	09.2	46.0	09 8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09 2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09 3	48.1	09.6	47 9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49 0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Dift.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dift.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Point		76 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	D p	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49 7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0		50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52 0	10 3	51 8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10 5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09 5	54.0	10.5	53.9	10.7	53 8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54 8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13 8	57
58	57.1	10 1	56.9	11.1	56.9	11.3	56,7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58 7	12.5	58.5	13.5	58.2	14.5	60
6:	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14 8	61
62	61.1	10 8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62,0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15 2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63,6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	6+ 6	13.7	64.3	14.8	64 0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	19.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15 5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14 6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69 7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17 2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70 4	15.0	70.2	16 2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15 2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14 3	73.6	14.6	73.4	15 6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74 6	14 5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75 8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15 6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79 2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14 2	80 5	15.6	80 4	16.0	80,2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81 5	15.8	81.4	16 2	81.2	17 3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82 2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14 9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21 0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20 5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90 0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20 9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16 5	93.3	18.1	93.2	18.5	92.9	19 7	92.6	21.4	92.2	23 0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94 9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20 8	97.4	22.6	97.0	24 2	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Point		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Dift.	1¼ Point Lat	Dep	15 Deg. Lat	Dep	16 Deg. Lat	Dep	1½ Point Lat	Dep	17 Deg. Lat	Dep	18 Deg. Lat	Dep	Dift.
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	0..9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.6	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04 8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	.08 7	02.2	08.7	02.3	08.7	02.5	08 6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02 4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10 7	02.7	10.6	02.8	10.6	03 0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12 6	03.2	12.6	03 4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14 5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	12.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04 7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17 4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05 5	18.2	05.6	18.1	05 9	19
20	19 4	04 9	19 3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06 5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	05.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	20.9	07.1	23
24	23.3	05 8	23.2	06.2	23.1	06 6	23.0	07.0	22.9	07.0	21.9	07.4	24
25	24.2	06.1	24.1	05.5	24.0	06.9	23.9	07.3	23.9	07.3	22.8	07.7	25
26	22.2	05.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	23.8	08.0	26
27	26.2	05.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	24.7	08.3	27
28	27.2	06 8	27.0	07.2	26.9	07.7	26 8	08.1	26.8	08 2	25.7	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	26.6	09.0	29
30	29 1	07 3	29.0	07.8	28.8	08 3	28.7	08.7	28.7	08.8	27.6	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08 5	29.7	09.0	29.6	09.1	28.5	09.6	31
32	31.0	07.8	30 9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	29.5	09.6	32
33	32.0	08 0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	30.4	10 0	33
34	33 0	08.3	32.8	08.8	32.7	09.4	32.5	09 9	32.5	09.9	32.3	10.2	34
35	33 9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34 9	08.7	34.8	09 3	34 6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.5	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	36.1	11.7	39
40	38.8	09.7	38.6	10 4	38.5	11 0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39 8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40 7	10.2	40 6	10.9	40 4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41 7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43 0	13.1	42.8	13.9	45
46	44 6	11.2	44.4	11.9	44 2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11 7	46.4	12.4	46.1	13 2	45.9	13.9	45.9	14 0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dift	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dift
	6¾ Point		75 Deg.		74 Deg.		6¼ Point		73 Deg.		72 Deg.		

Dift.	1¼ Point Lat	Dep	15 Deg. Lat	Dep	16 Deg. Lat	Dep	1½ Point Lat	Dep	17 Deg. Lat	Dep	18 Deg. Lat	Dep	Dift.
51	49,5	12,4	49,3	13,2	49,0	14,1	48,8	14,8	48.8	14.9	48.5	15.8	51
52	50,4	12,6	50,2	13,5	50,0	14,3	49,7	15,1	49,7	15.2	49 4	16.1	52
53	51,4	12,9	51,2	13,7	50,9	14,6	50,7	15,3	50.7	15.5	50.4	16.4	53
54	52,4	13,1	52,2	14,0	51,9	14,9	51,7	15,7	51.6	15.8	51.3	16.7	54
55	53,3	13,4	53,1	14,2	52,9	15,2	52,6	16,0	52.6	16.1	52 3	17.0	55
56	54,3	13,6	54,1	14,5	53,8	15,4	53,6	16,2	53.5	16.4	53.3	17.3	56
57	55,3	13,9	55,1	14,8	54,8	15,7	54,5	16,5	54.5	16.7	54.2	17 6	57
58	56,3	14,1	56,0	15,0	55,8	16,0	55,5	16,8	55.5	17.0	55.2	17,9	58
59	57,2	14,3	57,0	15,3	56,7	16,3	56,5	17,1	56 4	17.3	56.1	18.2	59
60	58,2	14,6	58,0	25,5	57,7	16,5	57,4	17,4	57.4	17.5	57.1	18.5	60
61	59,2	14,8	58,9	15,8	58,6	16,8	58,4	17,7	58.3	17.8	58.0	18.8	61
62	60,1	15,1	59,9	16,0	59,6	17,1	59,3	18,0	59,3	18.1	59.0	19.2	62
63	61,1	15,3	60,9	16,3	60,6	17,4	00,3	18,3	60.2	18.4	59.9	19.5	63
64	62,1	15,6	61,8	16,6	61,5	17,6	61,2	18,6	61,2	18.7	60.9	19.8	64
65	63,0	15,8	62,8	16,8	62,5	17,9	62,2	18,9	62,2	19.0	61.8	20.1	65
66	64,0	16,0	63,7	17,1	63,4	18,2	63,2	19,2	63.1	19.3	62.8	20.4	66
67	65,0	16,3	64,7	17,3	64,4	18,5	64,1	19,4	64.1	19.6	63.7	20.7	67
68	66,0	16,5	65,7	17,6	65,4	18,7	65,1	19,7	65.0	19.9	64.7	21.0	68
69	66,9	16,8	66,6	17,9	66,3	19,0	66,0	20,0	66.0	20.2	65.6	21.3	69
70	67,9	17,0	67,6	18,1	67,3	19,3	67,0	20,3	66.9	20.5	66.6	21.6	70
71	68,9	17,3	68,6	18,4	68,3	19,6	67,9	20,6	67.9	20.8	67.5	21.9	71
72	69,8	17,5	69,5	18,6	69,2	19,8	68,9	20,9	68.8	21.1	68.5	22.2	72
73	70,8	17,7	70,5	18,9	70,2	20,1	69,9	21,2	69,8	21.3	69.4	22.6	73
74	71,8	18,0	71,5	19,2	71,1	20,4	70,8	21,5	70,8	21.6	70 4	22.9	74
75	72,7	18,2	72,4	19,4	72,1	20,7	71,8	21,8	71.7	21.9	71.3	23.2	75
76	73,7	18,5	73,4	19,7	73,1	20,9	72,7	22,1	72.7	22.2	72.3	23.5	76
77	74,7	18,7	74,4	19,9	74,0	21,2	73,7	22,4	73.6	22.5	73.2	23.8	77
78	75,7	18,9	75,3	20,2	75,0	21,5	74,6	22,6	74.6	22.8	74.2	24.1	78
79	76,6	19,2	76,3	20,4	75,9	21,8	75,6	22,9	75.5	23.1	75.1	24.4	79
80	77,6	19,4	77,3	20,7	76,9	22,0	76,6	23,2	76.5	23.4	76.1	24.7	80
81	78,6	19,7	78,2	21,0	77,9	22,3	77,5	23,5	77.5	23.7	77.0	25.0	81
82	79,5	19,9	79,2	21,2	78,8	22,6	78,5	23,8	78,4	24.0	78.0	25.3	82
83	80,5	20,2	80,2	21,5	79,8	22,9	79,4	24,1	79.4	24.3	78.9	25.6	83
84	81,5	20,4	81,1	21,7	80,7	23,1	80,4	24,4	80,3	24 5	79.9	26.0	84
85	82,4	20,7	82,1	22,0	81,7	23,4	81,3	24,7	81,3	24.8	80.8	26.3	85
86	83,4	20,9	83,1	22,3	82,7	23,7	82,3	25,0	82,2	25.1	81.8	26.6	86
87	84,4	21,1	84,0	22,5	83,6	24,0	83,3	25,3	83.2	25.4	82.7	26.9	87
88	85,4	21,4	85,0	22,8	84,6	24,3	84,2	25,5	84,2	25.7	83.7	27.2	88
89	86,3	21,6	86,0	23,0	85,6	24,5	85,2	25,8	85.1	26.0	84.6	27.5	89
90	87,3	21,9	86,9	23,3	86,5	24,8	86,1	26,1	86,1	26.3	85.6	27.8	90
91	88,3	22,1	87,9	23,5	87,5	25,1	87,1	26,4	87.0	26.6	86.5	28.1	91
92	89,2	22,4	88,9	23,8	88,4	25,4	88,0	26,7	88,0	26.9	87.5	28.4	92
93	90,2	22,6	89,8	24,1	89,4	25,6	89,0	27,0	88.9	27.2	88.4	28.7	93
94	91,2	22,8	90,8	24,3	90,4	25,9	90,0	27,3	89 9	27.5	89.4	29.0	94
95	92,1	23,1	91,8	24,6	91,3	26,2	90,9	27,6	90.8	27.8	90.4	29.4	95
96	93,1	23,3	92,7	24,8	92,3	26,5	91,9	27,9	91.8	28.1	91.3	29.7	96
97	94,1	23,9	93,7	25,1	93,2	26,7	92,8	28,2	92.8	28.4	92.3	30 0	97
98	95,1	23,8	94,7	25,4	94,2	27,0	93,8	28,4	93.7	28.7	93.2	30.3	98
99	96,0	24,1	95,6	25,6	95,2	27,3	94,7	28,7	94.7	28.9	94.2	30.6	99
100	97,0	24,3	96,6	25,9	96,1	27,6	95,7	29,0	95.6	29.2	95.1	30.9	100
Dift.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dift.
	6¾ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		

Dif.	19 Deg.		1¼ Point		20 Deg		21 Deg.		22 Deg.		2 Points		Dif.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.2	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	05.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	45.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dif.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dif.
	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Dist.	19 Deg. Lat	19 Deg. Dep	1¼ Point Lat	1¼ Point Dep	20 Deg. Lat	20 Deg. Dep	21 Deg. Lat	21 Deg. Dep	22 Deg. Lat	22 Deg. Dep	2 Points Lat	2 Points Dep	Dist.
51	48,2	16,6	48,0	17,2	47,9	17,4	47,6	18,3	47.3	19.1	47.1	19.5	51
52	49,2	16,9	49,0	17,5	48,9	17,8	48,5	18,6	48.2	19.5	48.0	19.9	52
53	50,1	17,3	49,9	17,9	49,8	18,1	49,5	19,0	50.1	19.9	49 0	20.3	53
54	51,0	17,6	50,8	18,2	50,7	18,5	50,4	19,4	50.1	20.2	49.9	20.7	54
55	52,0	17,9	51,8	18,9	51,7	18,8	51,3	19,7	51.0	20.6	50.8	21.0	55
56	52,9	18,2	52,7	18,9	52,6	19,2	52,3	20,1	51.9	21.0	51.7	21.4	56
57	53,9	18,6	53,7	19,2	53,6	1,,5	53,2	20,4	52 8	21.4	52.7	21.8	57
58	54,8	18,9	54,6	19,5	54,5	19,8	54,1	20,8	53.8	21.7	53.6	22.2	58
59	55,8	19,2	55,5	19,9	55,4	20,2	55,1	21,1	54.7	22.1	54.5	22.6	59
60	56,7	19,5	56,5	20,2	56,4	20,5	56,0	21,5	55.6	22.5	55.4	23.0	60
61	57,7	19,9	57,4	20,6	57,3	20,9	56,9	21,9	56 5	22.8	56.4	23.3	61
62	58,6	20,2	58,4	20,9	58,3	21,2	57,9	22,2	57.5	23.2	57.3	23.7	62
63	59,6	20,5	59,3	21,2	59,2	21,5	58,8	22,6	58.4	23.6	58.2	24.1	63
64	60,5	20,8	60,3	21,6	60,1	21,9	59,7	22,9	59.3	24.0	59.1	24.5	64
65	61,5	21,2	61,2	21,9	61,1	22,2	00,7	23,3	60.3	24.3	60.1	24.9	65
66	62,4	21,5	62,1	22,2	62,0	22,6	61,6	23,7	61.2	24.7	61.0	25.3	66
67	63,3	21,8	63,1	22,6	63.0	22,9	62,6	24,0	62,1	25.1	61.9	25.6	67
68	64,3	22,1	64,0	22,9	63,9	23,3	63,5	24,4	63,0	25.5	62.8	26.0	68
69	65,2	22,5	65,0	23,2	64,8	23,6	64,4	24,7	64.0	25.8	63.7	26.4	69
70	66,2	22,8	65,9	23,6	65,8	23,9	65,4	25,1	64,9	26.2	64.7	26.8	70
71	67,1	23,1	66,8	23,9	66,7	24,3	66,3	25,4	65.8	26.6	65.6	27.2	71
72	68,1	23,4	67,8	24,3	67,7	24,6	67,2	25,8	66,8	27.0	66.5	27.6	72
73	69,0	23,8	68,7	24,6	68,6	25,0	68,2	26,2	67,7	27.3	67.4	27.9	73
74	70,0	24,1	69,7	24,9	69,5	25,3	69,1	26,5	68,6	27.7	68.4	28.3	74
75	70,9	24,4	70,6	25,3	70,5	25,6	70,0	26,9	69,5	28.1	69.3	28.7	75
76	71,9	24,7	71,6	25,6	71,4	26,0	71,0	27,2	70,5	28.5	70.2	29.1	76
77	72,8	25,1	72,5	25,9	72,4	26,3	71,9	27,6	71.4	28.8	71.1	29.5	77
78	73,7	25,4	73,4	26,3	73,3	26,7	72,3.	28,0	72.3	29.2	72.1	29.8	78
79	74,7	25,7	74,4	26,6	74,2	27,0	73,8	28,3	73.2	29.6	73.0	30.2	79
80	75,6	26,0	75,3	27,0	75,2	27,4	74,7	28,7	74.2	30.0	73.9	30.6	80
81	76,6	26,4	76,3	27,3	76,1	27,7	75,6	29,0	75.1	30.3	74.8	31.0	81
82	77,5	26,7	77,2	27,6	77,1	28,0	76,6	29,4	76.0	30.7	75.8	31.4	82
83	78,5	27,0	78,1	28,0	78,0	28,4	77,5	29,7	77.0	31.1	76.7	31.8	83
84	79,4	27,3	79,1	28,3	78,9	28,7	78,4	30,1	77.9	31.5	77.6	32.1	84
85	80,4	27,7	80,0	28,6	79,9	29,1	79,4	30,5	78.8	31.8	78.5	32.5	85
86	81,3	28,0	81,0	29,0	80,8	29,4	80,3	30,8	79.7	32.2	79.5	32.9	86
87	82,3	28,3	81,9	29,3	81,8	29,8	81,2	31,2	80,7	32.6	80.4	33.3	87
88	83,2	28,7	82,9	29,6	82,7	30,1	82,2	31,5	81,6	33.0	81.3	33.7	88
89	84,1	29,0	83,8	30,0	83,6	30,4	83,1	31,9	82,5	33.3	82.2	34.1	89
90	85,1	29,3	84,7	30,3	84,6	30,8	84,0	32,3	83,4	33.7	83 2	34.4	90
91	86,0	29,6	85,7	30,7	85,5	31,1	85,0	32,6	84,4	34.1	84.1	34.8	91
92	87,0	30,0	86,6	31,0	86,5	31,5	85,9	33,0	85.3	34.5	85.0	35.2	92
93	87,9	31,6	87,6	31,3	87,4	31,8	86,8	33,3	86,2	34.8	85 9	35.6	93
94	88,9	30,6	88,5	31,7	88,3	32,1	87,8	33,7	87.2	35.2	86.8	36.0	94
95	89,8	30,9	89,4	32,0	89,3	32,5	88,7	34,0	88.1	35.6	87.8	36.4	95
96	90,8	31,3	90,4	32,3	90,2	32,8	89,6	34,4	89.0	36.0	88.7	36.7	96
97	91,7	31,6	91,3	32,7	91,1	33,2	90,6	34,8	89 9	36.3	89.6	37.1	97
98	92,7	31,9	92,3	33,0	92,1	33,5	91,5	35,1	90.9	36.7	90.5	37.5	98
99	93,6	32,2	93,2	33,4	93,0	33,9	92,4	35,5	91,8	37.1	91.5	37.9	99
100	94,5	32,6	94,2	33,7	94,0	34,2	93,4	35,8	92.7	37.5	92.4	38.3	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

N 2

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	38.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.6	22.7	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		

Dift	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dift
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.3	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	85.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.2	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		

Diff	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¼ Point		31 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00 5	00.9	00 5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01 0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02 6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03 5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04 3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05 2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	05.1	03.4	05.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07 1	03 8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04 2	07 9	04.2	07 9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04 7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05 2	09.7	05.2	09.6	05.3	09.5	05 5	09 4	05.7	09.4	05 7	11
12	10.6	05.6	10.6	05.7	10 5	05.8	10 4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06 1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06 6	12.2	06.8	12.1	07.0	12.0	07.2	12 0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13 0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07 5	14.1	07.5	14.0	07.8	13 9	08 0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14 6	08.7	14.6	08.8	17
18	15.9	08,5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09 3	15.4	09 3	18
19	16.8	08.9	16 8	09.0	16.6	09.2	16.5	09 5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18 5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10 8	18.0	10.8	21
22	19.4	10 3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19 9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.8	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.3	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13 4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23 6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13 6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14 6	27.3	14 6	27.1	15,0	26.8	15.5	26.6	15 9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28 0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16 0	30.0	16 0	29.7	16.5	29 4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30 9	16.5	30.6	17.0	30 3	17 5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30 9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34 4	18.3	34.4	18 4	34.1	18.9	33.8	19.5	33.4	20.0	33 4	20 1	39
40	35 3	18.8	35 3	18.9	35 0	19.4	34 6	20.0	34.3	20.6	34 3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19 9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36 4	21 0	36.0	21.6	36 0	21.6	42
43	38.0	20.2	37.9	20 3	37.6	20 8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38 8	20.7	38.5	21 3	38.1	22.0	3.7.7	22 6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39 4	21.8	39.0	22 5	38 6	23 1	38.6	23.2	45
46	40 6	21.6	40.6	21,7	40.2	22.3	39 8	23 0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41 1	22.8	40 7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22 5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23 0	43 2	23.1	42.9	23 8	42.4	24 5	42 0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.6	24.2	43.3	25.0	42 9	25.7	42.9	25.7	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.0	30.5	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.0	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.0	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.0	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.0	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Diff.	32 Deg.		33 Deg		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00 6	00.8	00.6	00.8	00 6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01 6	01.1	01.6	01.1	01.6	01 2	2
3	02.5	01.6	02 5	01.6	02 5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03 3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04 0	02.9	5
6	05.1	03.2	05 0	03.3	05 0	03 3	05.0	03.3	04 9	03 4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05 8	03.9	05.7	04 0	05.7	04.1	7
8	06.8	04 2	06.7	04 4	05.6	04 4	06 6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04 8	07 5	04 9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05 3	9
10	08.5	05.3	08.4	05.4	08 3	05.6	08.3	05.6	08.2	05.7	08.1	05 9	10
11	09.3	05.8	09.2	06.0	0) 1	06.1	09.1	06.2	09 0	06.3	08.9	06.5	11
12	10 2	06.4	10.1	06.5	10 0	06.7	09.9	06.7	09 8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07 6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07 9	12.6	08.2	12.5	08.3	12.4	08 3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09 2	12.9	09.4	16
17	14 4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15 0	10.0	14.9	10.1	14 7	10.3	14.6	10.6	18
19	16.1	10 1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10 9	15.4	11.2	19
20	17.0	10.6	16 8	10.9	16 6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20 0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13 9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14 7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23 3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16 2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24 3	17.6	30
31	26.3	16.4	26.0	16.9	25 8	17 2	25.7	17.3	25 4	17.8	25.1	18.2	31
32	27.1	17.0	26 8	17.4	26.6	17.8	26.5	17 9	26.2	18.4	25.9	18.8	32
33	28 0	17.5	27.7	18 0	27.4	18.3	27.4	18 5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28 3	18.9	28.2	19.0	27 9	19.5	27.5	20 0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29 0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29 8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20 1	30.8	20 6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32 4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33 2	22.4	32.8	22 9	32.4	23.5	40
41	34.8	21.7	34.4	22 3	34.1	22.8	34 0	22 9	33.6	23 5	33 2	24.1	41
42	35 6	22.3	35 2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34 0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23 9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36 5	24 6	36.0	25.2	35 6	25.9	44
45	38 2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38 6	25 1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26 1	39.0	26 3	38 5	27.0	38.0	27.6	47
48	40 7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28 2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40 6	27 4	40.1	28.1	39.6	28.8	49
50	42.4	26 5	41.9	27.2	41.6	27.8	41 4	28.0	41.0	28.7	40.4	29.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg. Lat	Dep	33 Deg. Lat	Dep	3 Point Lat	Dep	34 Deg. Lat	Dep	35 Deg. Lat	Dep	36 Deg. Lat	Dep	Dist.
51	43,2	27,0	42,8	27,8	42,4	28,3	42,3	28,5	41,8	29,3	41,3	30,0	51
52	44,1	27,6	43,6	28,3	43,2	28,9	43,1	29,1	42,6	29,8	42,1	30,6	52
53	44,9	28,1	44,5	28,9	44,1	29,4	43,9	29,6	43,4	30,4	43,7	31,2	53
54	45,8	28,6	45,3	29,4	44,9	30,0	44,8	30,2	44,2	31,0	43,7	31,7	54
55	46,6	29,1	46,1	30,0	45,7	30,6	45,6	30,8	45,1	31,5	44,5	32,3	55
56	47,5	29,7	47,0	30,5	46,6	31,1	46,4	31,3	45,9	32,1	45,3	32,9	56
57	48,3	30,2	47,8	31,0	47,4	31,7	47,3	31,9	46,7	32,7	46,1	33,5	57
58	49,2	30,7	48,6	31,6	48,2	32,2	48,1	32,4	47,5	33,3	46,9	34,1	58
59	50,0	31,3	49,5	32,1	49,1	32,8	48,9	33,0	48,3	33,8	47,7	34,7	59
60	50,9	31,8	50,3	32,7	49,9	33,3	49,7	33,6	49,2	34,4	48,5	35,3	60
61	51,7	32,3	51,2	33,2	50,7	33,9	50,6	34,1	50,0	35,0	49,3	35,9	61
62	52,6	32,8	52,0	33,8	51,6	34,4	51,4	34,7	50,8	35,6	50,2	36,4	62
63	53,4	33,4	52,8	34,3	52,4	35,0	52,2	35,2	51,6	36,1	51,0	37,0	63
64	54,3	33,9	53,7	34,9	53,2	35,6	53,1	35,8	52,4	36,7	51,8	37,6	64
65	55,1	34,4	54,5	35,4	54,0	36,1	53,9	36,3	53,2	37,3	52,6	38,2	65
66	56,0	35,0	55,4	35,9	54,9	36,7	54,7	36,9	54,1	37,9	53,4	38,8	66
67	56,8	35,5	56,2	36,5	55,7	37,2	55,5	37,5	54,9	38,4	54,2	39,4	67
68	57,7	36,0	57,0	37,0	56,5	37,8	56,4	38,0	55,7	39,0	55,0	40,0	68
69	58,5	36,6	57,9	37,6	57,4	38,3	57,2	38,6	56,5	39,6	55,8	40,6	69
70	59,4	37,1	58,7	38,1	58,2	38,9	58,0	39,1	57,3	40,2	56,6	41,1	70
71	60,2	37,6	59,5	38,7	59,0	39,4	58,9	39,7	58,2	40,7	57,4	41,7	71
72	61,1	38,2	60,4	39,2	59,9	40,0	59,7	40,3	59,0	41,3	58,2	42,3	72
73	61,9	38,7	61,2	39,8	60,7	40,6	60,5	40,8	59,8	41,9	59,1	42,9	73
74	62,8	39,2	62,1	40,3	61,5	41,1	61,3	41,4	60,6	42,4	59,9	43,5	74
75	63,6	39,7	62,9	40,8	62,4	41,7	62,2	41,9	61,4	43,0	60,7	44,1	75
76	64,4	40,3	63,7	41,4	63,2	42,2	63,0	42,5	62,3	43,6	61,5	44,7	76
77	65,3	40,8	64,6	41,9	64,0	42,8	63,8	43,1	63,1	44,2	62,3	45,3	77
78	66,1	41,3	65,4	42,5	64,9	43,3	64,7	43,6	63,9	44,7	63,1	45,8	78
79	67,0	41,9	66,3	43,0	65,7	43,9	65,5	44,2	64,7	45,3	63,9	46,4	79
80	67,8	42,4	67,1	43,6	66,5	44,4	66,3	44,7	65,5	45,9	64,7	47,0	80
81	68,7	42,9	67,9	44,1	67,4	45,0	67,1	45,3	66,4	46,5	65,5	47,6	81
82	69,5	43,4	68,8	44,7	68,2	45,6	68,0	45,9	67,2	47,0	66,3	48,2	82
83	70,4	44,0	69,6	45,2	69,0	46,1	68,8	46,4	68,0	47,6	67,1	48,8	83
84	71,2	44,5	70,5	45,7	69,8	46,7	69,6	47,0	68,8	48,2	68,0	49,4	84
85	72,1	45,0	71,3	46,3	70,7	47,2	70,5	47,5	69,6	48,8	68,8	50,0	85
86	72,9	45,6	72,1	46,8	71,5	47,8	71,3	48,1	70,5	49,3	69,6	50,5	86
87	73,8	46,1	73,0	47,4	72,3	48,3	72,1	48,6	71,3	49,9	70,4	51,1	87
88	74,6	46,6	73,8	47,9	73,2	48,9	73,0	49,2	72,1	50,5	71,2	51,7	88
89	75,5	47,2	74,6	48,5	74,0	49,4	73,8	49,8	72,9	51,0	72,0	52,3	89
90	76,3	47,7	75,5	49,0	74,8	50,0	74,6	50,3	73,7	51,6	72,8	52,9	90
91	77,2	48,2	76,3	49,6	75,7	50,6	75,4	50,9	74,5	52,2	73,6	53,5	91
92	78,0	48,7	77,2	50,1	76,5	51,1	76,3	51,4	75,4	52,8	74,4	54,1	92
93	78,9	49,3	78,0	50,6	77,3	51,7	77,1	52,0	76,2	53,3	75,2	54,7	93
94	79,7	49,8	78,8	51,2	78,2	52,2	77,9	52,6	77,0	53,9	76,0	55,3	94
95	80,6	50,3	79,7	51,7	79,0	52,8	78,8	53,1	77,8	54,5	76,9	55,8	95
96	81,4	50,9	80,5	52,3	79,8	53,3	79,6	53,7	78,6	55,1	77,7	56,4	96
97	82,3	51,4	81,4	52,8	80,7	53,9	80,4	54,2	79,5	55,6	78,5	57,0	97
98	83,1	51,9	82,2	53,4	81,5	54,4	81,2	54,8	80,3	56,2	79,3	57,6	98
99	84,0	52,5	83,0	53,9	82,3	55,0	82,1	55,4	81,1	56,8	80,1	58,2	99
100	84,8	53,0	83,9	54,5	83,1	55,6	82,9	55,9	81,9	57,4	80,9	58,8	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg		

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Dist.	3¼ Point Lat	3¼ Point Dep	37 Deg. Lat	37 Deg. Dep	38 Deg. Lat	38 Deg. Dep	39 Deg. Lat	39 Deg. Dep	3½ Point Lat	3½ Point Dep	40 Deg. Lat	40 Deg. Dep	Dist.
1	00.8	00.6	00.8	00.6	00.8	00.6	00 8	00.6	00.8	00 6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	De	Lat	Dep	Lat	Dep	Lat	Dist.
	4¼ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	3¾ Point Lat	Dep	37 Deg. Lat	Dep	38 Deg. Lat	Dep	39 Deg. Lat	Dep	3½ Point Lat	Dep	40 Deg. Lat	Dep	Dist.
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	45.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.3	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	4¼ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	41 Deg. Lat	41 Deg. Dep	42 Deg. Lat	42 Deg. Dep	3¾ Point Lat	3¾ Point Dep	43 Deg. Lat	43 Deg. Dep	44 Deg. Lat	44 Deg. Dep	4 Points Lat	4 Points Dep	Dist.
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	03.0	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	05.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.8	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
Dist.	Dep 49 Deg.	Lat	Dep 48 Deg.	Lat	Dep 4¼ Point	Lat	Dep 47 Deg.	Lat	Dep 46 Deg.	Lat	Dep 4 Points	Lat	Dist.

Dift.	41 Deg. Lat	Dep	42 Deg. Lat	Dep	3¾ Point Lat	Dep	43 Deg. Lat	Dep	44 Deg. Lat	Dep	4 Points Lat	Dep	Dift.
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Dift.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dift.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Points		

The Ufe and Explanation of the Table of Difference *of* Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, it gives the Difference of Latitude and Departure in Minutes and Tenths, to any Diftance not exceeding 100 Miles, and to every Degree and Quarter Point of the Compafs; and may be ufed to a greater Diftance being taken out at twice or thrice, according to the Quantity of the Diftance, as fhall be fhewn in the Ufe.

The Courfe ftands at the Head and Foot of the Table, to every Degree and Quarter Point of the Compafs; at the Head it begins at 1 deg. fo 2 deg. $\frac{1}{4}$ Points, &c. encreafing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, fo 46 deg. 47 deg. $4\frac{1}{4}$ Points, &c. encreafing backwards to 90 deg. or 8 Points. The Diftance ftands in the two outmoft Columns under the Title *Dift.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure ftands under the Courfe at the Head, and over it at the Foot of the Table.

The Ufe of the T A B L E.

This Table is very ufeful in Navigation, efpecially in working a *Traverfe.*

Example 1. The Courfe and Diftance given, to find the Difference of Latitude and Departure by the Table.

Suppofe a Ship fails NNE. 3 quarters E. 95 Miles, the Difference of Latitude and Departure are required.

On the Right-hand Page (becaufe the Diftance is above 50) and at the Top (becaufe it is lefs than 4 Points) look for $2\frac{3}{4}$ Points, which is the Courfe; under which, and againft 95 the Diftance, and under the Title *Lat.* ftands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* ftands 48.8, which is 48 min. $\frac{8}{10}$ the Departure required?

Example 2. Suppofe a Ship fails South 56 deg. Wefterly 48 Miles, the Difference of Latitude and Departure required?

On the Left-hand Page (becaufe the Diftance is lefs than 50) and at the Bottom (becaufe it is more than 45d.) look for 56d. the Courfe; over which, and againft 48 the Diftance, over the Title *Lat.* ftands 26.8, that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ftands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required?

Example 3. Suppofe a Ship fails North Weft by North 160 Miles, the Difference of Latitude and Departure are required by the Table?

On the Right-hand Page at the Top, look for 3 Points the Courfe. Now becaufe the Table goes to but 100, take for 100 firft; therefore under 3 Points, and againft 100, under the Title *Lat.* ftands 83.1, that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ftands 55.6

that

that is 55 min. 6 tenths the Departure; then for 60 under 3 Points, againſt 60 under the Title *Lat.* ſtands 49.9, that is 49 min. 9 tenths the Difference of Latitude, and under the Title *Dep.* ſtands 33.3 that is 33 min. 3 tenths the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88.9 tenths, the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plane Sailing*, which for Brevity-ſake are committed here, being taught at large in the laſt Edition of *Practical Navigation*; but the general Uſe of it is in the exact Working of a Traverſe.

Example 1. Suppoſe a Ship bound to a certain Port, ſails S. E. by S. 49 min. then ESE. half E. 52 min. then E. by N. half E. 62 min. then SSW. half W. 57 min. then S. half E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances, firſt allowing for Lee-way, if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column; if Southerly in the South Column; if the Departure be Eaſterly it muſt be put in the Eaſt Column; if Weſterly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, the Remainder is the general Difference of Latitude and Departure.

The TABLE.

Courſes.	Diſtances	Diff. of Lat.		Departure	
		North	South	Eaſt	Weſt
S. E. by S.	49		40.7	27.2	
ESE. half E.	52		15.1	49.7	
E. by N. ½ E.	62	06.1		61.7	
S.S.W. ½ W.	57		50.3		26.9
S. half E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The general Diff. of Lat. is 138.8 tenths S. the Dep. 115.5 tenths E. then to find the Courſe and Diſtance, find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4. and half the Dep. 57.7; the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which at the Top I find 3½ Point for the Courſe South Eaſterly, or South Eaſt half South, and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example

Example 2. The Courſe given in Degrees, which often happens, by reaſon of Allowance for the Variation of the Compaſs, and in the like Caſes.

Suppoſe a Ship bound to a certain Port, ſails 65 Miles North, 34 deg. Weſterly. Then 56 Miles North, 67 deg. Weſterly. Then 48 Miles South 78 deg. Weſterly. Then 54 Miles North, 23 deg. Eaſterly. Then 36 Miles North, 6 deg. Eaſterly, the Difference of Latitude and Departure are required?

Courſes.		Diſtances	Diff. of Latitude		Departure	
			North.	South	Eaſt	Weſt
NW	34°	65	53.9			36.3
NW	67°	56	21.9			51.5
SW	78°	48		10.0		47.0
NE	23°	54	49.7		21.1	
NE	6°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24 9
			151.3			109.9

The general Difference of Latitude is 151.3 North, the Departure 109.9 Weſt. The Courſe and Diſtance is found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table*, (according to the *Middle Latitude* Sailing) thus, find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right againſt that in the Column of Diſtance, you have the Difference of Longitude; if your Departure is too large for the Table, take one half or one third thereof, and proceed as before.

Example. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Latitude 50 deg. 00 min. North, then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is 52 deg. 31 min. and conſequently the Middle Latitude is 51 deg. 16 min. it's Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding ſo far, I take its half, *viz.* 55, the neareſt to which in the Table, is, 54.7 (being leſs) againſt which, in the Column of Diſtance is 87, which doubled (becauſe I took half the Departure) the Sum 174 min. or 2d. 54 min. is the Difference
of

Longitude required, which is fufficiently exact for common Practice, only I would advife all Perfons for avoiding as much as poffible any Error, that every Time the Reckoning is corrected by an Obfervation, the Longitude be alfo corrected according to *Mercator's Sailing*, as you are taught in the laft Edition of *Practical Navigation.*
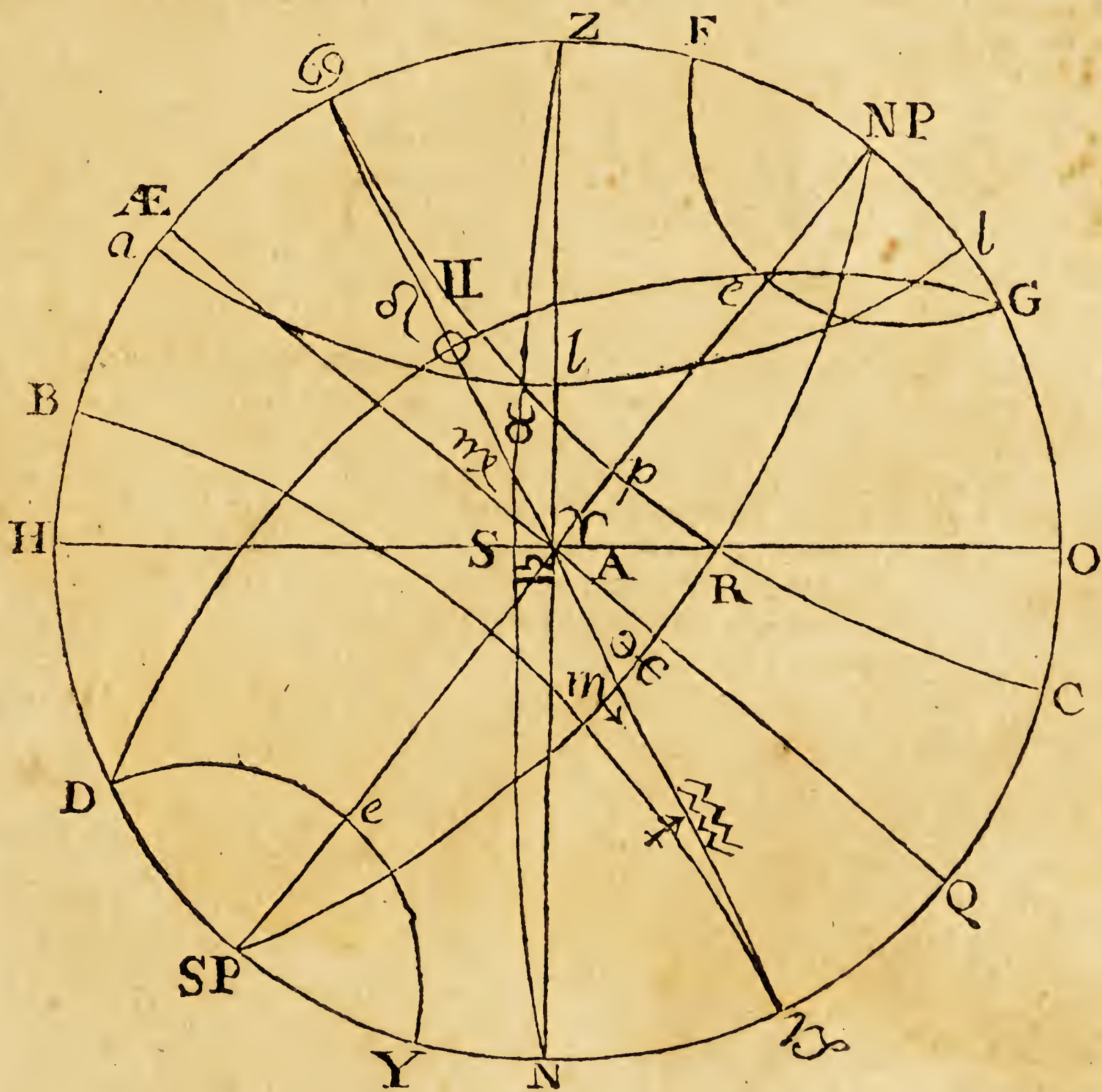
Some neceffary *Aftronomic Definitions.*

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppofite one to the other; the one vifible to us, called the North Pole, marked with the Letters N. P; the other not vifible to us, called the South Pole, marked with S. P.

The *Axis* of the World is a Line imagined to pafs from Pole to Pole, about which is performed the diurnal Revolution, as the Line, NP, A, SP.

The

The *Equinoctial* is a great Circle 90d. diftant from the Poles of the World, and divides the Globe into the North and South Hemifpheres; it is noted by the Letters Æ A Q.

The *Ecliptic* is a great Circle interfecting the Equinoctial in two oppofite Points, the beginning of *Aries*, and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈			Libra	♎		
Taurus	♉			Scorpio	♏		
Gemini	♊	called		Sagittarius	♐	called	
Cancer	♋	Northern Signs.		Capricornus	♑	Southern Signs.	
Leo	♌			Aquarius	♒		
Virgo	♍			Pifces	♓		

The *Ecliptic* is noted by the Characters of the 12 Signs as above.

The Poles of the *Ecliptic* are two Points 23d. 29m. from the Poles of the Equinoctial, reprefented by G and D.

The *Zodiac* is a Zone, having about 8 deg. in Breadth on either Side of the Ecliptic, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great Circles interfecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NP, R, SP.

The Tropics are two fmall Circles 23d. 29m. diftant from the Equinoctial, being parallel thereto, and limit the Sun's greateft Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*, the South Tropic is called the Tropic of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two fmall Circles 23d. 29m. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, viz. 90d. diftant from the Horizon, as Z.

The *Nadir* is the Point diametrically oppofite to the Zenith, as N.

The *Azimuths* are great Circles interfecting each other in the Zenith and Nadir, and cutting the Horizon at Right-angles, as Z S N.

The *Horizon* is a great Circle 90d. diftant from the Zenith and Nadir, and divides the World into the vifible and invifible Hemifpheres, as H A O.

The *Meridian* of a Place, is that Meridian that paffeth by the Zenith and the Nadir, of the faid Place, and is reprefented by the Circle Z N P O Q N S P H Æ Z.

Parallels of Altitude or *Almicanters*, are fmall Circles parallel to the Horizon; imagined to pafs through any Degree of Altitude, between the Horizon and the Zenith, as *a l t*.

Parallels of Declination or *Latitude*, are fmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with refpect to the Heavens, and Parallels of Latitude refpecting the Earth, as ♋ *p* R C.

Circles of the Longitude in the Heavens, are great Circles interfecting each other in the Poles of the Ecliptic, and cutting the Ecliptic at right Angles, as G, ☉, D.

Parallels of Latitude in the Heavens, are fmall Circles parallel to the Ecliptic.

The *Latitude* of a Star is an Arch of a Circle of Longitude contained between the Center of the Star and the Ecliptic, and is accounted either Northerly or Southerly.

The *Longitude* of a Star is an Arch of the Ecliptic, intercepted between a Circle of Longitude paffing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star is an Arch of the Meridian contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Afcenfion* is that Degree and Minute of the Equinoctial that comes to the Meridian with the Center of the Sun or Star.

Oblique Afcenfion is the Degree and Minute of the Equinoctial that rifeth with the Center of the Sun or Star, in an Oblique Sphere.

Oblique Defcenfion is the Degree and Minute of the Equinoctial that fets with the Center of the Sun or Star, in an Oblique Sphere.

Afcenfional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Defcenfion or Afcenfion, or it is the Difference of the Time between the Sun-rifing or fetting, and fix o'Clock.

The *Amplitude* is an Arch of the Horizon, being the Diftance of the Rifing or Setting of the Sun or Star from the Eaft or Weft, and is accounted either Northerly or Southerly.

The *Latitude* of a Place is the Height of the Pole above the Horizon, or the Diftance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equator contained between the Meridian of the Place, where the Longitude is affigned to begin, and the Meridian of any other Place, and is accounted either Eafterly or Wefterly.

Aftronomic Problems ufeful in NAVIGATION.
PROBLEM I.

THE Sun's Place and greateft Declination given, to find it's prefent Declination.

Example.

Suppofe the Sun's Place to be 20d. 30m. in *Gemini*, the greateft Declination is 23d. 29m. it is required to find the prefent Declination.

The Operation by the Logarithms.

As Radius ———————————————————	10.000000
Is to S. Sun's greateft Declination 23d. 29m. ————————	9.600409
So is S. Sun's Longitude 8od. 30m. from *Aries* —————	9.994003
To S. Sun's prefent Declination 23d. 09m. North ————	9.594412

By

By Gunter.

The Extent from Radius S. 90d. to S. 23d. 29m. will reach from S. 80d. 30m. to the S. 23d. 9m. the Sun's Declin. N. becaufe in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point. Therefore if the Sun be in *Aries, Taurus, Gemini, Capricornus, Aquarius* or *Pifces,* the Longitude is accounted from *Aries* ; but if in *Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius,* it is accounted from *Libra.*

Aries, Taurus, Gemini, Cancer, Leo, Virgo, are called Northern Signs, *Libra, Scorpio, Sagittarius, Capricornus, Aquarius* and *Pifces,* are called Southern Signs. Confequently, if the Sun's Place be in any of the firft fix Signs, the Declination is North ; but if in any of the latter fix, the Declination is South.

PROB. II.

The Sun's greateft Declin. and prefent Declin. given, to find his Place.

The Sun's greateft Declination is 23d. 29m. and prefent Declination is 18d. 30m. North increafing, the Sun's Place required ?

By the Logarithms.

As the S. of the Sun's greateft Declination 23d. 29m. ——————— 9.600409
To the Radius ——————————————————— 10.000000
So is the Sine of the prefent Declination 18d. 30m. North —— 9.501476
To the Sine of the Sun's Longitude 52d. 46m.—————— 9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries,* becaufe the Declination is North and increafing, that is 22d. 46m. of *Taurus* ; but if the Declination had been North decreafing, it muft have been accounted from *Libra,* and then it would have been 7d. 14m. in *Leo.*

By Gunter.

The Extent of the Compaffes from the Sine 23d. 29m. the greateft Declination to Radius, S. 90d. will reach from S. 18d. 30m. the Sun's prefent Declination, to 52d. 46m. the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateft Declination given, to find the Right Afcenfion.

Example.

The Sun's Place 10d. 30m. in *Aquarius,* the Right Afcenfion is required.

The Operation by the Logarithms.

As Radius —————————————————————— 10.000000
To the Tangent of the Sun's Longitude from *Aries* 49d. 30m. 10.068501
So is the S. c. of the greateft Declination 23d. 29m. ——— 9.962453
To the Tangent of the Sun's Right Afcenfion 47d. 2m. —— 10.030954

By Gunter.

The Extent from Radius S. 90d. to S. c. of the greateft Declination 66d. 41m. will reach from Tangent Sun's Longitude from *Aries* 49d. 30m. to the Tangent of the Right Afcenfion 47d. 02m. required.   *Note,*

Note, This Proportion gives the Sun's Right Afcenfion from the next Equinoctial Point; but it ought to be accounted from *Aries* according to the Order and Succeffion of the Signs, and therefore in this Cafe 47d. 2m. fubtracted from 360d. (becaufe the Sun is in the 4th Quarter of the Ecliptic, or South decreafing) gives 312d. 58m. the Right Afcenfion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operations by the Logarithms.

As S. c. of the Latitude 51d. 32m. ———————— 9.793832
To Radius ———————————————— 10.000000
So is the S. of the Declination 15d. 20m. North ———— 9.422318
To the S. of the Sun's Amplitude 25d. 9m. ———— 9.628486

By Gunter.

The Extent from the S. c. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, will reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is alfo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Afcenfional Difference.

Example.

Suppofe in the Latitude 51d. 32m. North, the Sun's Declination is 10d. 45m. North, and the Afcenfional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51d. 32m. ——————9.900086
To Radius ———————————————— 10.000000
So is the Tangent of the Sun's Declination 10d. 45m. ——— 9.278424
To the Sine of the Afcenfional Difference 13d. 49m. ——— 9.378338

By Gunter.

The Extent from Tangent 38d. 28m. (the Complement of Latitude) to Tangent 10d. 45m. the Sun's Declination; will reach from Radius S. 90d. to S. 13d. 49m. the Sun's Afcenfional Difference as above.

PROB.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, Find the Aſcenſional Difference by the Fifth Problem.

Secondly, The Right Aſcenſion by the Third Problem.

When the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, gives the Oblique Deſcenſion. But when one is North and the other South, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 Degrees, then ſubtract the Aſcenſional Difference therefrom.

Or, if both being added together exceed 360 Degrees, the Exceſs is the Oblique Aſcenſion or Deſcenſion.

PROB. VII.

To find the Time of the Sun's Riſing and Setting, and Length of the Day or Night.

Find the Aſcenſional Difference by the Fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 Degrees of the Equinoctial one Hour, and for every Degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference added to ſix Hours, gives the Time of Sun-ſetting; and ſubtracted is the Time of Sun-riſing.

2. But if one be North and the other South, then the Aſcenſional Difference added, gives the Time of Sun-riſing; and ſubtracted is the Time of ſetting.

The Time of Sun-ſetting doubled, gives the Length of the Day; the Time of Suns-riſing doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, ſuppoſe the Sun's Declination 21d. 57m. North, the Aſcenſional Difference is 30d. 29m. which reduced in Time is

H. M. S.

　2　01　56
　6　00　00

Sun ſetteth — 8　01　56 } doubled is { 16　03　52 } length of the { Day.

Sun riſeth — 3　58　04 } { 07　56　08 } { Night.

PROB.

P R O B. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth.

The R U L E.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination, add them together, and take the half Sum; subtract the Compl. of the Declination from the half Sum, and take the Remainder; then set down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms is the S. c. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90d. you must add 90 Degrees thereto, and then proceed as before.

Example I.

In the Latitude 51d. 32m. North, the Sun's Declination is 20d. 30m. North, his Altitude 47d. 30m. and his Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
42 : 30	Compl. Altitude A. M. ————— S. Co. Ar. — 0.170317
38 : 28	Compl. Latitude North ————— S. Co. Ar. — 0.206168
69 : 30	Compl. Declination N. or Sun's Distance from the Pole.

150 : 28 Sum

75 : 14 Half Sum ———— ———— ———— ————S. ——9.985414

5 : 44 Excess of the Half Sum above c. Decl. S. —— 8.999559

Sum 19.361458

61d. : 21m. ———— S. c. ——————— Half Sum 9.680729

61d. : 21m.

doubled 122d. : 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's *Scale.*

The Extent of the Compasses from Radius S. 90d. to S. 42d. 30m. the Complement of the Altitude, will reach from S. 38d. 28m. the Complement of the Latitude, to Sine 24d. 40m. then the Extent from Sine 24d. 40m. to Sine 75d. 14. the half Sum will reach from S. 5d. 44m. (the Excess of the half Sum, above the Complement Declination) to 122d. 42m. (upon the Line of versed Sines) which is the Azimuth required.
Example

Example 2. In the Latitude of 51d. 32m. North, the Sun's Declination is 18d. 15m. South, his Altitude 17d. 45m. and the Azimuth from the North required ?

The Operation by the Logarithms.

d.　m.

72 : 15 Compl. Altitude ——————————————S. Co. Ar. 0.021183
38 : 28 Compl. Latitude ————————————S. Co. Ar. 0.206168
108 : 15 Declination 90 Degrees being added, becauſe South.

------

218 : 58 Sum

------

109 : 29 Half Sum ſupp. to 18d. is 70d. 31m. S. ——— 9.974391
　1 : 14 Remainder ——— ——— ——— — S. ——— 8.332920

　　　　　　d.　 m.　　　　　　　　　　　Sum 18.534666
　　　　　79 : 20 ——— S. c. ——— half Sum —— 9.267333
　　　　　79 : 20

Which doubled is 158 : 40 the Azimuth from the North required.

By Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Comp. Altitude will reach from Sine 38d. 28m. the Complement Latitude, to S. 36d. 20m. then the Extent from Sine 36d. 20m. to 70d. 31m. the Supplement of 109d. 29m. (the half Sum) to 180d. will reach from the Remainder 1d. 14m. to 158d. 40m. (upon the Lines of verſed Sines) the Sun's Azimuth as above.

In South Latitude the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame Manner you may find the Azimuth of any Star.

P R O B. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude of 51d. 32m. North, ſuppoſe the Sun's Declination 23d. 29m. North, the Altitude 36d. 30m. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude, add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Comple-

　　　　　　　　　　　　　　　　　　　　　　　　　ment

ment Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms, is the S.c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by Logarithms.

```
d.    m.
66 : 31  Compl. Declination —— —— —— S. Co. Ar.  0.087547
38 : 28  Compl. Latitude  ——— —— —— S. Co. Ar.  0.206168
53 : 30  Compl. Altitude

158 : 29

79 : 14  Half Sum —— —— —— —— Sine —  9.992287

25 : 44  Remainder —— —— —— —— Sine —  9.637673

                                        Sum  19.873675
d.    m.
30   09 —— S. c. —— —— Half Sum  9.936837
30   09
```

which doubled is 60   18, and reduced into Time, makes 4 hours 1 min. ⅕ the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. ⅕ subtracted from 12 hours, leaves 7 hours 58 min. ⅘ for the Time in the Morning.

If the Declination had been Southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem; do the same when the Declination is North in South Latitude.

By Gunter.

The Extent of the Compasses from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Versed Sines) the Hour of the Day as above.

PROBLEM X.

Having the Latitude of the Place, the Sun's Right Ascension, with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Q   *Example.*

Example.

In the Latitude 51 deg. 32 min. North, on the 18th of *January*, 1761. the Sun's Right Afcenfion was 20 hours 3 min. the Right Afcenfion of the *Lion's-Tail* was 11 hours 35 min. the Declination 16 deg. 6 min. North, the Altitude 30 deg. 30 min. to the Eaftward of the Meridian, the Hour of the Night required.

The R U L E.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Sun's Altitude; add them together, and take the half Sum, fubtract the Complement of the Altitude from the half Sum, and referve the Remainder; then fet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of thefe four Logarithms, is the S.c. of half the Diftance from the Meridian.

The Operation by Logarithms.

d.	m.			
73	: 54	Compl. Star's Declination ——	S. Co. Ar.	00.17377
38	: 28	Compl. Latitude —— ——	S. Co. Ar.	0.206168
59	: 30	Compl. Star's Altitude		

171 : 52

85	: 56	Half Sum —— ——	Sine ——	9.998905
26	: 26	Remainder —— ——	Sine ——	9.648512

Sum 19.870962

30d. 28m. —— S. c. —— Half Sum 9.935481
30d. 28m.

which doubled is 60d. 56m. and reduced into Time, gives four Hours three Minutes, forty-four Seconds, or three quarters of a Minute.

By the Directions given in the Ufe of the Table of the Sun's Right Afcenfion, and of the Right Afcenfion and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaftward of the Meridian fubtract the Star's Diftance from the Meridian in Time, from the Time of the Star's coming upon the Meridian;

bnt

But if the Star be to the Weftward of the Meridian, add the Star's Diftance from the Meridian, to the Time of the Star's coming to the Meridian ; the Sum or Difference is the Hour of the Night. In this Example, the Sun's Right Afcenfion 20 Hours 03 Minutes fubtracted from the Star's Right Afcenfion (with 24 Hours added thereto) 35 Hours 35 Minutes, leaves 15 Hours 32 Minutes, the Time of the Star's coming on the Meridian ; from which fubtracting 4 Hours, 3 Minutes, 44 Seconds, the Hour above found, leaves 11 Hours, 28 Minutes, 16 Seconds, the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, inftead of taking the Complement Declination to 90 deg. there muft be 90 deg. added thereto, as has been fhewn in the Eighth preceeding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compaffes from Radius S. 90 deg. to the S. of 73 Degrees 54 Minutes, the Complement of the Star's Declination, will reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 40 Minutes ; then the Extent from the S. 36 Degrees 40 Minutes, to S. 85 Degrees 56 Minutes the half Sum, will reach from S. 26 Degrees 26 Minutes the Remainder, to 60 Degrees 56 Minutes (upon the Line of Verfed Sines required ;) with which proceed as has been directed to find the Hour of the Night.

Courfes and Diftances between fome of the moft eminent Places on the Coaft of England, *&c. As alfo the thwart Courfes between the Eaft Coaft of* England *and* Holland, *the South Coaft of* England *and* France, *and the Weft Coaft of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth,* NW. by N.	14
From *Buchanefs* to *Cathnefs,* North Weft	27
From the *North Foreland* to *Flufhing,* Eaft	24
From the *North Foreland* to the *Texel,* NE. by N. half E.	50
From the *Spurn* to the *Texel,* Eaft by South	55
From *Tinmouth* to the *Naze* of *Norway,* NE. by E.	118
From *Tinmouth* to *Holy Land,* Eaft by South	110
From *Tinmouth* to the *Scaw,* Eaft North Eaft	110
From *Yarmouth* to the *Texel,* Eaft by North	34

Leag.

From *Newcastle* to *Maes Deep*, ENE.——— ——— ——— ——— ——— 83
From *Aberdeen* to *Maes Deep*, South Eaſt ——— ——— ——— ——— 113
From the *North Foreland* to the *Maes*, ENE. ——— ——— ——— 30
From *Newcastle* to the *Fly*, ESE.——— —— ——— ——— ——— ——— 90
From *Scarborough* to *Holy Land*, Eaſt Northerly — —— ——— ——— 97
From the *Start* to the *Eddyſtone*, Weſt half South ——— ——— ——— 7
From the *Lands-end* to *Scilly*, WSW. three quarters Weſt — —— ——— 9
From the *Caſkets* to *Blakeneſs*, Eaſt North Eaſt — —— ——— ——— 55
From *Beachy* to *Blakeneſs*, Eaſt a quarter North ——— ——— ——— 15
From *Dover* to *Diep*, South half Weſt —— — —— ——— ——— ——— 25
From the *Lizard* to *Guernſey*, Eaſt by South — — — —— ——— ——— 35
From the *Start* to *Seven Iſles*, South half Eaſt — —— ——— ——— 25
From *Scilly* to *Uſhant*, South Eaſt by South—— — — ——— ——— 35
From the *Lizard* to *Uſhant*, South—— — — — ——— ——— ——— 29
From *Hartland Point* to the Iſland of *Lundy*, North — — ——— ——— 3
From *Lundey* to the *Holms*, Eaſt by North, Northerly—— — —— ——— 18
From *Black Rock* to *Tuſcar*, Eaſt North Eaſt — — —— ——— ——— 3
From Cape *Glear* to *Old Head*, Eaſt by North — ——— ——— ——— 13
From *Greſholm* to *Waterford*, Weſt by North — — —— ——— ——— 21
From the *Land's-end* of *England* to *Tuſcar*, North by Weſt — —— 40
From the *Land's-end* of *England* to *Waterford*, NNW. — ——— ——— 40
From *Holy Head* in the Iſland *Angleſea*, to the Bar of *Dublin*, W. by N. 18
From *Rochel* to *Black Rock*, South by Eaſt — ——— ——— ——— 80
From the *Land's-end* of *England* to *Cape Clear*, NW. by W. — —— 55
From the *Land's-end* of *England* to *Old Head*, North Weſt — ——— 45

A TABLE *of the Soundings coming into the* Channel, *reſpecting the Bearing and Diſtances of* Scilly, Uſhant, *the* Lizard, *&c. with the Depth in Fathoms, and the various Sorts of Ground.*

Bearings.	Distance	Lat. D. M.	Depth of W.	The various Sorts of Ground.
South	05	50 20	50	Branny ſand, like grⱳund wheat
S S E.	05	50 12	45	White ſand mixed with ſhells
S S E.	06		50	Coarſe ouſe
E S E.	06		53	Coarſe ſand and fine red ſhells
E by S.	08	50 12	78	Ouſe ſand, Queens ſhells amongſt it
E by N.	07	49 15	72	Ouſe like-muſtard ſeed with broken ſhells
E by N.	15	48 50	72	Pepper ſand, black and yellow *Scilly*

Bearings.	Dist.	Lat. D.	Lat. M.	Depth	The various Sorts of Ground.
E by N.	4	49	50	72	Black, white and red stones with ouse
E N E.	07	49	15	60	Some black sand
E N E.	20	49	15	80	Rocky ground
E N E.	55			103	Fine white sand
NE by E.	22	49	10	85	Sand and ouse together
NE by E.	10	49	20	55	White and red sand mix'd with shells
NE by E.	50	49	50	100	White sand with ouse and nits
NE by E.	25	49	50	64	Branny sand with white and red shells
NE by E.	06	49	10	48	Black sand
NE by E.	13	49	43	65	Branny sand with some pieces of shells
North East	10	49	40	65	Branny sand, small stones, herring bones
NE by N.	10	49	20	57	Small red sand
N N E.	10	49	47	100	White sand then entring on the Bank
N by E.	18			68	Red sand with black and white scollop shells
North	12	49	15	65	Broken shells with white and red sand
North	10	49	47	65	White sand on the East part of the Bank
N N W.	33	48	52	77	Red sand and shells amongst it
NW by N.	07	49	40	54	More shells, the *Lizard* NE. dist. 18 leag.
North West	04	50	10	50	Branny sand with black and broken shells
North West	07	49	47	60	Stony ground
NW by N.	04	50	25	61	Red and black sand, with glistering shells
NW by W.	2½			44	Shells and sand like Points of Needles
W by N.	13	50	25	63	Fine white sand with little ouse
West	21	50	08	66	Red and black sand with glistering shells
W by S.	32	49	50	75	Fine white sand and glistering shells
W by S.	3½			40	Like broken wheat or coarse Bran
North	06	48	36	63	Full of small Maes sand
N by E.	18	48	15	80	Round stones mixed with scollop shells
NE by N.	11			60	Small beaten shells and Hakes Teeth
North East	29	48	50	85	Great and small pieces of Cockle shells
North East	25	48	10	55	Grey and brown sand with white shells
NE by N.	07	48	30	68	White and grey Maes sand
E N E.	14	48	36	68	Small shells and herring-bones
E by N.	2?	48	30	85	White and grey sand with small red stones
East	18	49	00	70	Branny sand with some shells
East	06	49	00	65	Red sand, shells, things like needles points
East	15	49	15	70	Fine white sand
East	33	49	15	87	Dazling sand like Barley-straw
East	04	49	10	60	Full of Maes sand and broken shells

Scilly.

Ushant.

E by S.

Bearings.	Dist.	Lat. D. M.	Depth	The various Sorts of Ground.
E by S.	14	48 56	63	Shells like Perriwinkles
E S E.	15	48 15	70	Shells grey and red pieces of Cockle shells
E S E.	12	49 20	68	Grofs white sand with shells
E S E.	8	49 5	64	White shells and fine small stones
E S E.	6		61	Hakes teeth and shells like oatmeal husks
SE by E.	20	49 15	72	Great stones like peafe and beans
SE by E.	9	49 15	65	Sand and some shells
SE by E.	37	48 30	65	Jame's shells
SE by E.	15	49 25	60	Small scollop shells, with some stones

Ushant. (left margin)

Bearings.	Dist.	Depth	The various Sorts of Ground.
North Eaft	6½	43	Marshy shells and some scollop shells
NE by N.	10	52	Marshy shells and Hakes teeth
N N E.	9	50	Marshy shells like Oatmeal husks
N by E.	15	58	Marshy shells and Hakes teeth
North	1	39	Stones as big as Beans four Leagues off
North Weft	5	45	Grey sand like Oatmeal flour
North Weft	3	46	Marshy shells like small stones
W N W.	3½	47	Small shingly stones, and marshy shells
W by N.	4	49	Fine marshy shells like white stones
W by S.	3	41	Black gravelly Ground with small stones
NE by E.	12	57	Scollop shells
NE by E.	4	44	Great stones and rough Ground
North Eaft	6½	50	Like Husks of Oatmeal and small stones

Lizard. (left margin)

Bearings	Dist.	Depth	The various Sorts of Ground.
N. ½ a Mile		35	Dirty brown sand and Hakes teeth
W. 2 Miles		34	Dirty brown sand
S, 1 Mile		26	Fine sand, and within this 28 and 30 fathom

Eddystone. (left margin)

Bearings	Dist.	Depth	The various Sorts of Ground.
N by E. N.ly	8½	40	Like the Duft of a Grindstone with Hakes teeth and shells
NW by W.	4½	43	
NW by N.	3	38	Gravelly sand, small stones and shells
N by W W.ly	12	38	Redish shells mashed as if beat in a mortar, white sand and scollop shells.
NW by W.	14	43	

Start. (left margin)

Foreland

	Bearings.	Dist.	Depth	*The various Sorts of Ground.*
Foreland.	NE by E.	08	35	Small shingly stones as big as Pease
	North	08	40	Streamy Ground with small stones
	N by E.	5½	33	The same with some black sand
	NE by N.	11	41	Fine sand and scollop shells
	N N E.	08	40	Fine sand, scollop shells and small stones
	NE by E.	2½	27	Shingly Ground
	W N W.	2½	20	Small stones
Needles	NE by E.	02	17	Great shingly Ground
	NE half E.	2½	17	Small shingly Ground
	North East	02	13	Rocky Ground
I Wight	N by W.	3½	20	All the Ground from St. *Alban's* to the East-end
	E by N.	04	21	of the *Wight* is chalky and brown Sand
	N by E.	03	18	
Dunnose	W by S.	04	16	Rough Ground with some big stones
	West	04	21	A kind of sandy fishy Ground
	W N W.	08	33	Fishy Ground somewhat red, with stones as big
	N by W.	06	26	as Pease, and small Beans.

Directions to sail into some of the Principal Habours on the Coast of England.

Directions to sail into Scilly.

SCILLY is divided into divers Islands; along the West-side lieth a great many Rocks. There are several Channels through which to go in, but the Southermost called St. *Mary's* Sound is the best, being a fair opening of the Channel, but near the Midst lie two sunken Rocks, which in foul Weather the Sea may be seen to break over: It is best to leave them on the Larboard-side going in, and on the Starboard-side coming out. Go so near the Starboard-shore, as that a Stone might almost be thrown on it. And when you are within the Point, luff up round, and come to an Anchor in Sight of the Houses; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard-side.

Directions for sailing into Mount's-Bay.

To anchor in Gover's Lake.

There are two sunken Rocks, which lie right in the Way of going into the Lake, about a Mile without your Anchoring Place; these Rocks lie NNW. and SSE. about half a Mile in length, to shun which observe the following Directions.

If the Wind is in the Eastern Hank, give the Eastern Shore about a League Birth, and keep St. *Paul*'s Church wholly in Sight above the Hill, 'till you bring a Church on the Eastern Shore a Sail's Breadth to the Northward of St. *Michael*'s Mount, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul*'s Church down under the Hill, then let go your NE. Anchor, and carry the other to the SW. and you will be well moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll go clear of them to the Eastward, and when it shuts down you are to the Westward of them, and when upon them, the Top of the Tower and a long Hedge is in one, about 6 or 7 Feet at low Water.

If the Wind is in the Southern or Western Hank, keep the Land on board, which is bold; you may go within a Quarter of a Mile of the Point: run till you shut *Mousehole* Island in, and St. *Paul*'s Church down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before-mentioned: Be sure to have the Church on the Eastern Shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never start, the Wind at SSE. or SE. heaves in a great Sea, and raises a great Ground Sea when it blows hard; the harder it blows you have a stronger Outset in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will sooner start with the Wind to the N. or NW. because the Ground goes out with a little Descent.

To sail into Foy.

Foy may be very easily known, lying in between two high Lands; on the West-side going in, is an old Church and Castle, and on the East-side the Ruins of an old Church, as you may see by the making of it in Capt. *Collin*'s Draught of *Foy*. The going in is a Cables Length over from Side to Side, and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch* War, in the Year 1666, there was above sixty Sail of *Virginia* Ships put into this Harbour. This Place lieth NE. and SW. in and out, which makes it a better Out-let to the Westward than *Plymouth* or *Falmouth*. And whereas

it hath been reported to be a Bar Harbour, and that you cannot enter till half Tide, I do aſſure you that there is no leſs than three Fathom at Low-water at a Spring-Tide; here you may lie aſhore to waſh, tallow, or ſtop Leaks; the Spring-Tides riſe and fall 16 or 17 Feet, and it is Highwater here at Full and Change a Quarter paſt Five. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the ſaid Weſt-ſide, lieth a Rock above Water, you may ſail in on either Side of it, on the Inner-ſide of the Eaſt Point lie alſo ſome Rocks off the Shore; on the Eaſt-ſide is deepeſt Water, and moſt Room, therefore in going in, give the Eaſt-Point a large Birth; there will be 7 or 8 Fathom. Keep the ſaid Shore till you come within St. *Maud's* Caſtle; which when it bears Eaſt, there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth* Caſtle, and ſo it muſt be kept till you ſhut the Church over *Penny Comquick*, into the North Eaſt-end of the *Smithick*, and ſo bear over to St. *Maud's*, and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in four Fathom, as ſhall be moſt convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth* Sound lieth a high round Rock called *Mewſtone*; between it and *Ramhead* lieth the ſaid Sound, North North Eaſt, being round and deep.

A little to the Northward of *Ramhead*, is a fair ſandy Bay, where is good Anchoring cloſe under the Land, in 9 or 10 Fathom: South a little Eaſterly from *Ramhead*, lies a Rock above Water called the *Eddyſtone*, (on which is erected a Light-houſe) the Point of *Plymouth* lies from it N. by E. diſtant about 4 Leagues.

In the Sound, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas* or *Drake* Iſland, which is joined to the Weſt-ſide with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide of the Land of *Plymouth*, till *Catwater* open on the Starboard-ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the

Point

Point, on the Starboard-side, leaving most Part of the Channel on the Starboard-side, until you come within the Point, and anchor there right against the high steep Northern Land; there is at Low-water, with extraordinary high Tides 4 and 5 Fathom.

In sailing into *Catwater*, be sure to give a good Birth to the Southern Point of the Entry, for there lies off the said Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about twelve Feet Water at half Flood, which Buoy must be left on the Starboard-side going in, and when *Catwater* is altogether open you may run in to the Eastward, leaving in the Entry of the Harbour two-thirds of the Channel on the Starboard-side, as aforesaid, because the South-shore is somewhat flat off, there lying a sandy Bank, which reaches to the Second Point of the South-shore of *Catwater*.

A little to the Eastward of *Drake* Island lies a Rock under Water, upon which at Low-water it is not deeper than two Fathom. To sail within the Land you may go to the Eastward or Westward of the Rock, as Occasion serves.

To sail into Dartmouth.

Dartmouth hath a narrow Entrance lying in between two high Lands: On each Side of the Haven standeth a little Castle; on the West-side is a Church on the high Land, called St. *Patrick*'s Church. To sail in coming from the Westward run in along by the West Land, so far to the Eastward until the Key of the Village (on the East-side of the Heaven) be brought in the midst of the Entry of the Haven between the two Lands: It's convenient to have a Boat ready (if any Gust of Wind should come from the high Land) to tow in. Being come in, edge over to the West-side before the Brewhouse, and anchor there in 10 or 11 Fathom, or before the Village to the East-side at Pleasure. At the East-side lieth a sunken Rock, to avoid which steer in with St. *Patrick*'s Church, and do not bring the Village which standeth on the West-side of the Harbour, without the said Church, but keep the outer House of the said Village in the East-side of the Chapel, always in Sight, without the Bulwarks on the North-side by St. *Patrick*'s Church, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, nearest to *Dartmouth*, standeth a white square Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To sail into Torbay.

Bring the West Point of the *Berry* S. by E. or SSE. from you; and anchor there in 7 or 8 Fathom, where you shall be Landlock'd for a S. and SW.

SW. Wind. At the North Eaft-end of the Bay is alfo a Tide Haven called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fathom, according as you defire to be nearer or further from the Shore.

Directions for failing in at the Eaft-end of the Ifle of Wight *to* Portfmouth Harbour, *and alfo to* Hampton.

If you come from the Eaftward with a Northerly Wind, bound into the *Ifle of Wight* or *Portfmouth*; after you come to the Weftward of the Shoal called the *Owers*, hale in North Weft with St. *Hellen*'s Point; but do not hale too much to the Northward, for there lies a Bank off of *Longftone* Haven to the Eaftward of the *Horfe*, that hath not above 13 Feet on it at Lowwater; but keeping in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the SE. End of the Sand called the *Horfe*. St. *Hellen*'s Church being SW. by W. from you, you may run in 5 Fathom, and when you have brought the Weftermoft great white Patch, or Chalk upon *Poft-Down* (which is the high Land to the Northward of *Portfmouth*) a Ship's Length to the Weftward of *South-Sea* Caftle that ftands upon the Beach, then you may luff up without Fear: Being then to the Weftward of the *Horfe*, and fteering with that Mark, it will lead you in along the *Horfe* unto the Beach, and fo into the Harbour of *Portfmouth*, keeping along clofe by the Shore, until you come by the Town-wall's End, and there you muft bear off a little for a Flat, that lieth off from the Shore, this is for an Eafterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown-Down*, (which is to the WNW. of *Haflewood* Point) within a Ship's Length without the faid Point, then you may bear to the Weftward along the Outfide of the *Spit*, which is the Shoal on the Weft-fide of the Entrance of *Portfmouth* Haven.

If the Wind be Wefterly or Southerly, and you are coming from the Weftward, and defign for St. *Hellen*'s Road or *Stokes-Bay* (from *Dunnofe* to St. *Hellen*'s Point, the Courfe is NE. by N. and NNE.) but borrow no nearer to St. *Hellen*'s than 6 or 7 Fathom, for the *Spit* lies off a great Way; but if it be clear Weather, that you may keep *Sand-Down* Caftle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; fteer along in this Mark until you open St. *Hellen*'s Church about two Ship's Length open of the *Red-Cliff* within St. *Hellen*'s Point or *Port-Sea* Caftle to the Eaftward of *South-Sea* Caftle, then are you clear of the Point, and may fteer to St. *Hellen*'s Road NW. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water, on very good Ground.

Note, That you have no good clear Ground all along the Island, until you have opened St. *Hellen's* Church, as aforesaid, and have brought the Point to bear from you SSW.

From St. *Hellen's* Point, to go between *No-Man's-Land* and the *Horse,* the direct Course in, is NW. by N. and NW. but you have no Shoaling upon the SW. side of *No-Man's-Land,* for you have 16 Fathom, and the next Cast but 3; but at the *Horse* you may stand into 10, 9 or 8 Fathom: If the strong Tide be spent, and smooth Water, you shall have a great washing of them by the Overfall of the Water; but especially on *No-Man's-Land,* if it be clear Weather, there are two very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the Isle of *Wight,* that they may be seen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and so up all along the Island without some middle Ground that lieth SSW. off the Point *No-Man's-Land.*

Also from St. *Hellen's* Point (if it be clear Weather that you can see it) there is a direct Mark, *viz.* a Part of an Old Castle formerly called *Haslewood* Castle, standing on *Gilkicker* Point (which is kept white,) keep *Gosport* Church and that Castle in one, or this Castle in the Middle of the Wood about the Church, which sheweth with a Valley like a Saddle, and so you may run directly in without Fear. Or if the Wind be so that you are forc'd to turn in, then you may run the said Mark within two Sail's Breadth of each End of the Wood. In the Middle of the Channel is about 11 Fathom Water; and if you bring the said Mark right under the North-End of the Wood, you shall run in a middle Ground near the *Horse,* that hath not above 10 Feet on it at Low-water, and hard Sand.

Being in *Yarmouth* Road, and you would sail out of the *Needles,* steer away from *Hurst* Castle, which Place is very steep; being past the Castle, steer away for the *Needles,* which are sharp white Rocks; giving a Birth to some Rocks that lie off from the Island-side in the Fair-way, between the Castle and the *Needles,* you must keep close to the *Needles.* The Tide of Ebb setteth on the *Shingles,* which are hard Stones. The Flood setteth on the *Needles.*

To sail into the *Needles,* you will know the going in by the high white Land which is the West-end of the *Isle of Wight;* run boldly in with the Land, till you see the *Needles* Rocks, and then keep close to them, observing the Tides, as in the Directions coming out. *Note,* That there is a strong Indraught that sets in at the *Needles,* and into *Pool;* which Indraught hath haul'd many Ships into *Freshwater* Bay. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight.*

To sail within the Wight *in thick Weather.*

To sail between the Main and the *Wight* in thick Weather, borrow in 6 Fathom off St. *Hellen's,* and steer NW. by N. and NNW. from St. *Hellen's*

Point, till you have 12 Fathom, and then fteer more Wefterly, as you find the Depth ; come no nearer *No-Man's-Land* than 9 or 10 Fatham ; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly ; but if it be large keep in 14 or 15 Fathom, which is a good Birth from both Sides, and fo fteer W. by S. and WSW. as you find the Depth until you come to *Cows. Note,* That being about *Stoke's-bay,* there will be lefs Water ; if you go nearer to *Cows,* there you may anchor in 12 or 14 Fathom, in the midft of the Channel, where is oufey Ground.

Directions for Dover-Road.

The beft Ground in *Dover-Road* is with the *Whiteway,* to the NW. of *Dover-Caftle,* or between that Hill that comes from St. *James's* Church, which is a flat Steeple at the North-end of *Dover* Town, for a thwart Mark, and fo in what Depth you pleafe, from 12 to 14 Fathom. Thwart of *Foulkftone* in 12 or 14 Fathom is very good Ground.

Directions to fail into the North-Foreland through the Gulls in the Night.

If your Ground Tackle fhould fail in the Night riding at the *North-Fore-land,* as very often hath happened, and you cannot weather the *Foreland,* weather the *Northfand-head* ; if you can fee but the *North-Foreland* Light, when that Light-houfe bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (fteering SSW.) you may be fure it will carry you directly through with the *Brake,* by keeping your Lead carefully, and borrowing no nearer the *Brake* than five Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you ; this Courfe will lead you through without Danger.

Directions for the North-end of the Goodwin, for fuch as fail from the North-Foreland to the Southward in the Night.

If you be at the *North-Foreland,* bound for the *Downs,* and the Tide fall out too early or too late ; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be fure to weigh Anchor in convenient Time, to be at the *North-fand-head* at the turning of the Tide to the Southward. From the *Foreland* you may fteer out with a Flood Tide, SE. by E. and SE. or keep the Light of the *North-Foreland* NW. by N. this Courfe will lead you out. But for the more Certainty, be fure keep the Lead well, and then you may borrow off and on with the forefaid Winds in 7 or 8 Fathom, and fteering out with the forefaid Courfe, you fhall find the Depth fuddenly change to 15 or 20 Fathom :

then

then you may hale close up to the Southward, along the Back of the *Good-win*, the Eastermost-side of which lies SSW. and NNE. 12 or 14 Fathom, and is not above a Saker-shot from the Sand. But if it be in the Day Time, and the Wind blows so hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-sand-head*, is a flat Church upon the *Foreland*, called St. *Peter*'s, a Ship's Length to the North-ward of *Broad-stairs* Pier-head; or borrow upon the Sand by the Lead as aforesaid, and so taking the first of the Tide without the Sand, you may stand to the South Eastward, till the *South-Foreland* bears W. by S. then cast about, and you shall weather the *South-sand-head*, and be in the *Downs* Road as soon as any other Ship that parted with you at the *Foreland*.

Directions for sailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin* or *King's-Channel*, and that you would sail into *Har-wich* over the Buoy of the *Spits* into the *Wallet*, you must observe your Tides, for at the *Spits*, the Buoy lieth in 5, 6 and 7 Feet Water at Low-water, and the Passage often alters, sometimes more Water, sometimes less. The Buoy lieth on the West-end of the *Gunfleet-sand*, and the East-end of the *Buxey*, being from a flat Steeple, called *Great Holland* Church, South by East. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, six, seven and eight Fathom Water; the Sands lying without, makes it a most excellent Road. There is a good and deep Channel to sail in at the *Wallet* between the *Gunfleet* and the *West* Rock; but 'tis seldom used. Being over the *Spits* in the *Wallet*, steer away for the *Naze*, which may be known by the Trees, and a House that standeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank, which hath but 5 Feet Water on it at Low-water; and lieth from the *Naze* Trees E. by N. About a Mile and an half from the *Naze* Point, there is about 8 or 9 Feet Water between it and the *Naze* at Low-water; Keep *Payn*'s Trees that lie a little to the Southward of *Harwich*, open and shut with *Harwich-Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Cork-land*, just open of the *Naze-land*, will carry you on the Bank also. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will also carry you between the *Pyesand* and the Ridge, into the *Rowling-Grounds*, where the Ships anchor in 3 or 4 Fathom at Low-water. The Mark to an-chor in the best of the *Rowling-Ground*, is to bring *Harwich* Windmill two Sails Breadth open of *Harwich-Cliff*: And to sail from the *Rowling-Ground* to the *Naze*, keep *Payn*'s Trees open off *Harwich-Cliff*, till you bring the

Naze

Naze to bear SW. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to ſail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees SW. ſailing down NE. between the Cork and the Ridge, in 5, 6 and 7 Fath. Water. And when you have brought *Harwich* Steeple on the Brewhouſe that lieth to the Northward of *Languard* Fort, then are you clear of the Cork Ledge; this Channel is much uſed by the Light Colliers going to the Northward.

Being in the *Rowling-Grounds*, and that you would ſail into *Harwich* Harbour, keeping cloſe by the *Andrews*, which is a Sand that lieth off from *Languard* Fort, and is ſteep too on the Weſt-ſide: The Tide of Ebb runneth ſtrong over the *Andrews*, the firſt half Ebb, of which you muſt have a Care. This Sand is dry at Low-water; keep cloſe by the Beach of *Languard* Fort, to avoid the *Altar*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard* Fort, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 or 6 Feet at Low-water. You may ſail to the Weſt-ward of it, between it and *Harwich* Cliff, according as the Tide is up, and what Draught of Water your Ship draweth: But if you ſhould want to go into *Harwich* at Low-water, and your Ship draweth above 15 Feet, you may ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard* Fort. Being paſt the *Glutton*, you muſt keep cloſe to the Beach to avoid the *Griſtle*, that lieth in the Middle between *Harwich* and the Beach of *Languard* Fort, on which is but three Feet at Low-water, there is a ſmall Channel between the *Griſtle* and the Guard, of nine Feet at Low-water, but when you have opened *Dover* Court Church off *Harwich* Town, then you are clear of the *Griſtle* and the Guard, and may anchor before the Town of *Harwich* in five Fathom Water, or run into *Ipſwich* Water and anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a-ſhore ſhe can take no Harm, the Shore being ſoft ouſey. The Spring Tides riſe 15 and 16 Feet, and the Niep-Tides 10 and 11 Feet.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to ſail over the *Spits*, then keep down by the *Gunfleet-ſand*, in 7 and 8 Fathom Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit* ESE. from the Sand about a Cable's Length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood ſetteth ſtrong into the *Wallet*; of which you muſt have a
Care

Care when you come near it, efpecially in little Winds or Calms, you may be hauled on the *Gunfleet-fand*; this Sand lieth NE. and SW. and drieth in feveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* SE. by E. Eafterly; you may ftand into 7 or 8 Fathom along the fide of the W. Rock into the *Sledway*, keeping *Balfey* Church N. by W. and NNW. till you bring *Harwich* Steeple on the Brewhoufe (that lieth to the Northward of *Languard* Fort) which will carry you clear of the Cork Ledge, on which is two Fathom and an half at Low-water, and then ftand to the Weftward, and keep *Orford* Church and Caftle open of *Balfey* Church a Sail's Breadth, 'till you have the Lights together, keep them fo till you are paft the *Andrews*, and then follow the former Directions for failing into *Harwich*; you may ftand in upon the *Platters* into five Fathom, on which Sand is but two and three Feet at Low-water; the Ridge hath feven Feet at Low-water; a great Part of the Cork Sand drieth at Low-water; and lieth in Length NE. and SW. about two Miles and a half long, and a Mile broad: Weft Rocks lie in Length NE. and SW. about three Miles, and two Miles broad, and drieth in feveral Places, full of Banks and Swatches, the Ground rocky and ftony in many Places; there is a fmall narrow Channel between the Weft Rocks and the Cork.

For the more particular Directions for failing into thefe and other Harbours in *England*, *Scotland*, *Holland*, *Normandy*, *Bretagne*. &c. fee the laft Edition of the COASTING-PILOT, newly Corrected, and Reprinted for W. and J. MOUNT, T. PAGE and SON, on *Tower-Hill*, *London*, with many Additions.

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